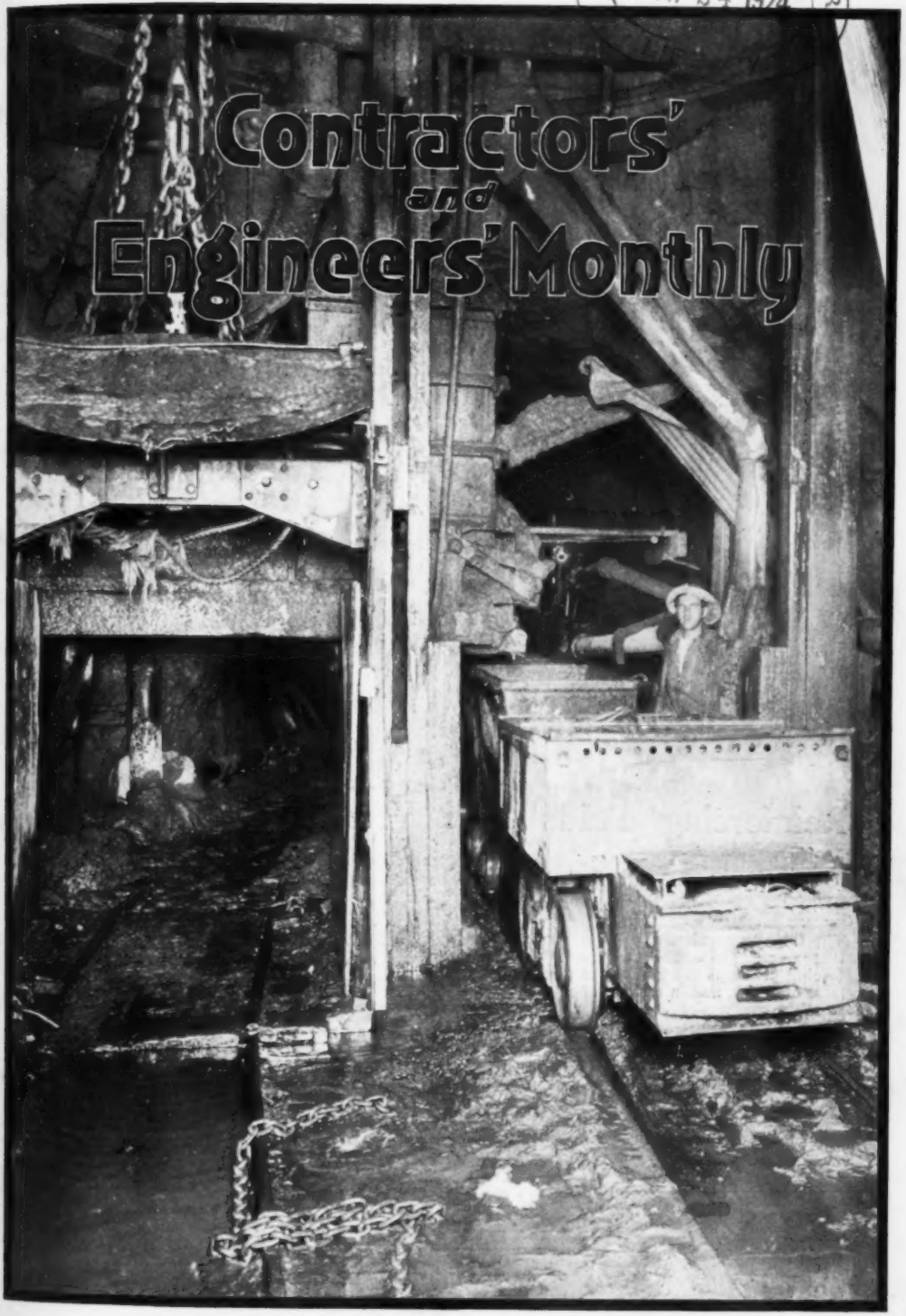
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THE JOHN CRERAR
MAY 24 1924

Contractors' and Engineers' Monthly

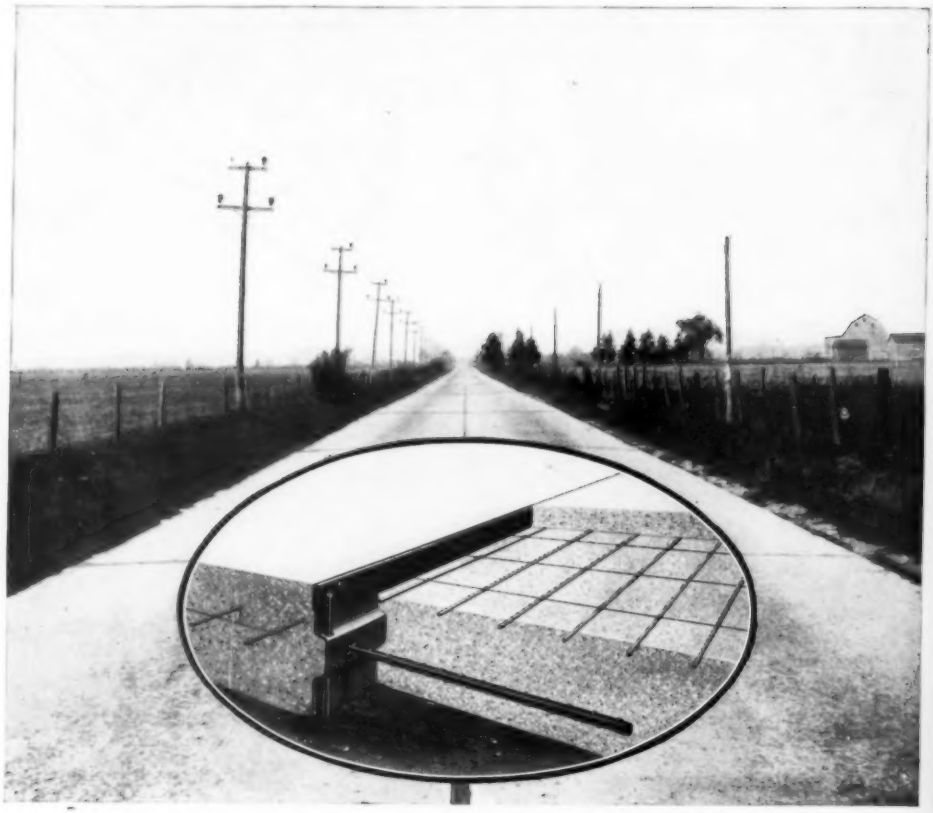


**Allaben Division, Shandaken Tunnel, New York Water-Supply,
View at Bottom of Shaft 7, During Construction**

MAY, 1924

See Pages 53-58

25 Cents $1 a Year



Truscon Wire Mesh and Truscon Longitudinal Contraction Joint

Reinforcing Adds Five Years to Pavements

It has been proven beyond a doubt that reinforced roads, because they stand heaviest traffic for years, are more economical and satisfactory than plain concrete roads.

The Ohio State Highway Department found that actual experience indicated that reinforcing prolongs the life of the pavement at least one-fifth, and in maintenance cost made "a clear saving of $106.97 for every mile every year."

Roads reinforced with Truscon Wire Mesh and Truscon Longitudinal Joints (see illustration) stand heaviest duty and save approximately 30% in the end over costs of plain concrete roads.

These, together with Truscon Curb Bars which protect concrete curbs against abrasion shocks, give a combination which assures the long lasting, economical concrete road.

Send for a copy of our book, "Modern Road Construction," which covers this entire subject in detail.

TRUSCON STEEL COMPANY, Youngstown, Ohio

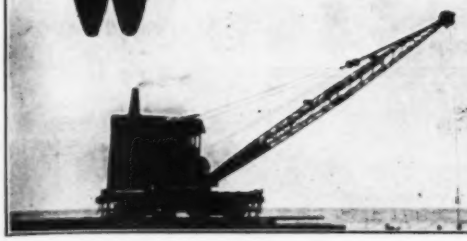
Warehouses and sales offices from Pacific to Atlantic. For addresses see 'phone books of principal cities.
Canada: Walkerville, Ont. Foreign Div.: New York

TRUSCON
WIRE MESH AND
CONTRACTION JOINTS

VOL. VIII. No. 5 CONTRACTORS' & ENGINEERS' MONTHLY MAY, 1924
Entered as second-class matter, April 16, 1923, at the Post Office at New York, N. Y., under Act of March 3, 1879
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Price 25 Cents, $1 Yearly Printed in U. S. A.



Where to Purchase



A comprehensive classification of the leading machinery and supply manufacturers arranged for the convenience of contractors, engineers and public officials who may wish to secure information about construction equipment. A star (*) before the manufacturer's name indicates that his advertisement appears in this issue.

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Standard Oil Co. of La., New Orleans, La.
Standard Oil Co. of N. J., Newark, N. J.
Standard Oil Co. of N. Y., New York.
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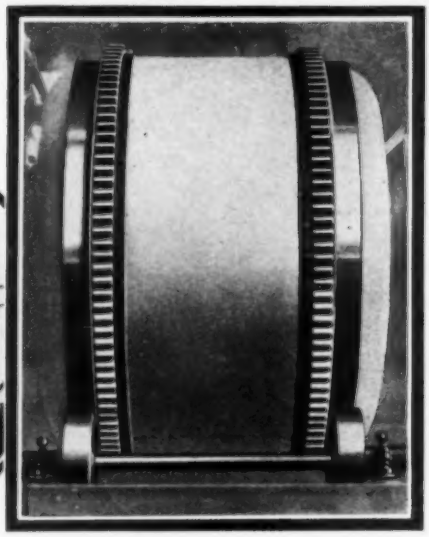
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KOEHRING





Besting Wabbly Rollers

IF they wabble they throw moving parts out of alignment, cause crystallization, wear and breakages in every part of the mixer.

They *will* wabble sooner or later unless they are spaced wide apart to receive the direct load of the drum as aggregate shifts from end to end—unless they have a type of bearing that equalizes the wear over the full face of the bearings.

Koehring placement of drum rollers, and Koehring drum roller bearings, (the freight car truck type) together with the smooth rolling action of Koehring double drum gear drive do away with the greatest cause of breakages and depreciation at the source — wabbly rollers.

Koehring Heavy Duty construction means trouble-free, longest service life.

Capacities

Pavers—7, 10, 14, 21, 34 cubic feet mixed concrete. Regular steel wheels or solid rubber tires; half or full length multiplanes. Boom-and-bucket or spout distribution. Double adjustable derrick on 21 E and auxiliary water tank on 21 E and 32 E if desired. Batch meter.

Construction Mixers—10, 14, 21, 28 cubic feet mixed concrete. Skids, or trucks with rubber tires optional. Power charging skip. Charging chute or batch hopper.

Dandie Mixers—4 and 7 cubic feet mixed concrete. Regular steel wheels, disc wheels with rubber tires, or flanged railroad wheels. Charging skip or low charging platform and hopper. Light duty hoist. Mixes mortar as well as concrete.

Write for Catalog P. 6

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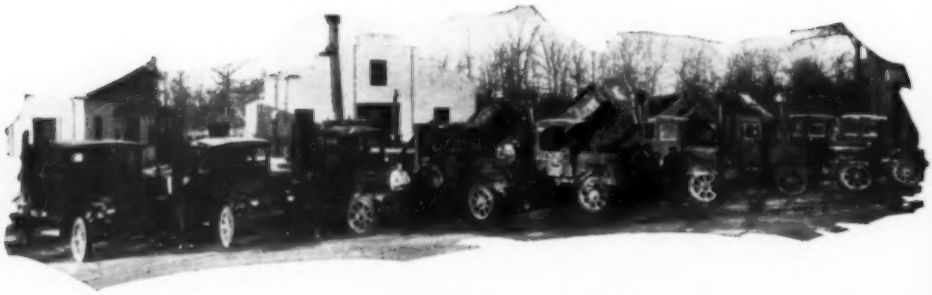
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The runaway trolley car was traveling at top speed down a hill and struck the Garford on the extreme right of the bumper. The impact completely demolished the trolley car and knocked the Garford forty feet.

Much to the surprise of those who witnessed the collision the two occupants of the Garford, protected by the closed cab, were not even scratched.

The truck itself after the wreckage of lumber had been cleared away, and a careful investigation made, was not harmed beyond one broken spring.

The stability displayed by this one truck is built into every Garford. It means not only greater safety, but longer service and lower hauling costs as well.

WRITE today for further particulars.

The Garford Motor Truck Company, Lima, Ohio

Manufacturers of Motor Trucks 1 to 7½ Tons

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For years—



owners of P & H Gasoline Shovels have loaded them onto flat cars under their own power without any dismantling whatsoever. This has saved both time and money.

Excavating Machinery Division

Pawling & Harnischfeger Co.

Established in 1884

3819 National Avenue, Milwaukee, Wis.

New York, Chicago, Pittsburgh, Philadelphia, Phoenix, Salt Lake City, Denver, Los Angeles, San Francisco, Portland, Seattle, St. Louis, Birmingham, Memphis, Dallas, Atlanta, Kansas City

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Follow the Corduroy Trail —the "Tread" Mark of the P & H

P&H GAS SHOVEL

Portable Machinery Co., Passaic, N. J.
Sessions Foundry Co., Bristol, Conn.
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CATCH BASINS (See Castings, Street and Sewer)

CATCH BASIN CLEANING APPARATUS
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Elgin Sales Corp., New York.

CAULKING MACHINERY AND TOOLS
Helwig Mfg. Co., St. Paul, Minn.
Ingersoll-Rand Co., New York.
Mueller Company, Decatur, Ill.

CEILINGS, METAL
Berger Mfg. Co., Canton, O.
Canton Art Metal Co., Canton, O.
Globe Iron Roofing & Cor. Co., Cincinnati, O.
Newport Rolling Mill Co., Newport, Ky.
Klauer Mfg. Co., Dubuque, Iowa.
Mesker & Co., Geo. L., Evansville, Ind.
Milwaukee Corrugating Co., Milwaukee, Wis.
Wheeling Corrugating Co., Wheeling, W. Va.

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***Pennsylvania Cement Co., New York.**
Ætna Portland Cement Co., Detroit, Mich.
Allentown Portland Cement Co., Allentown, Pa.
Alpha Portland Cement Co., Easton, Pa.
Ash Grove Lime and Portland Cement Co., Kansas City, Mo.
Atlas Portland Cement Co., New York.
Atlas Portland Cement Co. (of Kansas), Independence, Kans.
Bath Portland Cement Co., Philadelphia, Pa.
Beaver Portland Cement Co., Portland, Ore.
Bessemer Limestone and Cement Co., Youngstown, O.
Bonner Portland Cement Co., Kansas City, Mo.
Canada Cement Co., Ltd., Montreal, Canada.
Castalia Portland Cement Co., Pittsburgh, Pa.
Clinchfield Portland Cement Corp., Kingsport, Tenn.
Colorado Portland Cement Co., Denver, Colo.
Continental Portland Cement Co., St. Louis, Mo.
Coplay Cement Manufacturing Co., Coplay, Pa.
Cowell Portland Cement Co., San Francisco, Cal.
Crescent Portland Cement Co., Wampum, Pa.
Dewey Portland Cement Co., Kansas City, Mo.
Dexter Portland Cement Co., Nazareth, Pa.
Diamond Portland Cement Co., Cleveland, Ohio.
Dixie Portland Cement Co., Chattanooga, Tenn.
Edison Portland Cement Co., New York.
Fredonia Portland Cement Co., Fredonia, Kans.
Giant Portland Cement Co., Philadelphia, Pa.
Gilmore Portland Cement Corp., Gilmore City, Iowa.
Glens Falls Portland Cement Co., Glens Falls, N. Y.
Golden State Portland Cement Co., Los Angeles, Cal.
Gulf States Portland Cement Co., Demopolis, Ala.
Hawkeye Portland Cement Co., Des Moines, Ia.
Helderberg Cement Co., Albany, N. Y.
Hercules Cement Corp., Philadelphia, Pa.
Indiana Portland Cement Co., Indianapolis, Ind.
International Portland Cement Co., Ltd., Spokane, Wash.
Kansas Portland Cement Co., Kansas City, Mo.
Knickerbocker Portland Cement Co., Inc., New York.
Kosmos Portland Cement Co., Louisville, Ky.
Lawrence Portl'd Cement Co., Northampton, Pa.
Lehigh Portland Cement Co., Allentown, Pa.
Louisville Cement Co., Louisville, Ky.
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Missouri Portland Cement Co., St. Louis, Mo.
Monarch Cement Co., Humboldt, Kans.
Monolith Portland Cement Co., Los Angeles, Cal.
National Cement Co., Birmingham, Ala.
Nazareth Cement Co., Nazareth, Pa.
Nebraska Cement Co., Denver, Colo.
Newago Portland Cement Co., Newago, Mich.
New Egyyptian Portland Cement Co., Fenton, Mich.
New York & New England Cement & Lime Co., New York.
Northwestern States Portland Cement Co., Mason City, Ia.
Ogden Portland Cement Co., Ogden, Utah.
Oklahoma Portland Cement Co., Denver, Colo.
Old Mission Portland Cement Co., San Francisco, Cal.
Olympic Portl'd Cement Co., Ltd., Seattle, Wash.
Oregon Portland Cement Co., Portland, Ore.
Pacific Portland Cement Co., San Francisco, Cal.
Peerless Portland Cement Co., Union City, Mich.
Peninsular Portland Cement Co., Cement City, Mich.
Penn-Allen Cement Co., Allentown, Pa.
Petoskey Portland Cement Co., Petoskey, Mich.
Phoenix Portland Cement Co., Nazareth, Pa.
Portland Cement Co. of Utah, Salt Lake City, Utah.
Pyramid Portland Cement Co., Des Moines, Ia.
Riverside Portl'd Cement Co., Los Angeles, Cal.
San Antonio Portland Cement Co., San Antonio, Tex.
Sandusky Cement Co., Cleveland, Ohio.
Santa Cruz Portland Cement Co., San Francisco, Cal.
Security Cement and Lime Co., Hagerstown, Md.
Signal Mountain Portland Cement Co., Chattanooga, Tenn.
Southern States Portland Cement Co., Rockport, Ga.
Southwest'n Portland Cement Co., El Paso, Tex.
Standard Portland Cement Corp., San Francisco, Calif.
San Portland Cement Co., Portland, Ore.
Superior Portland Cement Co., Seattle, Wash.
Texas Portland Cement Co., Dallas, Tex.
Three Forks Portland Cement Co., Denver, Colo.
Tidewater Portland Cement Co., Baltimore, Md.
Trinity Portland Cement Co., Dallas, Tex.
Union Portland Cement Co., Ogden, Utah.
United States Potash Co., Los Angeles, Cal.
U. S. Portland Cement Co., Denver, Colo.
Universal Portland Cement Co., Chicago, Ill.
Vulcanite Portland Cement Co., Philadelphia, Pa
Wabash Portland Cement Co., Detroit, Mich.
Wellston Iron Furnace Co., Jackson, Ohio.
Whitehall Cement Mfg. Co., Philadelphia, Pa.
Wolverine Portl'd Cement Co., Coldwater, Mich.
Wyandotte Portland Cement Co., Detroit, Mich.

CEMENT GUNS
Cement Gun Co., Allentown, Pa.

CEMENT INSPECTION (See Inspecting Laboratories)

CEMENT TOOLS
***Abrams Cement Tool Co., Detroit, Mich.**

CHAINS
American Chain Co., Inc., Bridgeport, Conn.
Chain Belt Co., Milwaukee, Wis.
Columbus McKinnon Chain Co., Columbus, O.
Diamond Chain & Mfg. Co., Indianapolis, Ind.
Jeffrey Mfg. Co., Columbus, O.
Link-Belt Co., Chicago, Ill.
Niagara Metal Stamp Corp., Niagara Falls, N. Y.
U. S. Chain & Forge Co., Pittsburgh, Pa.
Webster Mfg. Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

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Arnold, Hoffman & Co., Inc., New York.
Du Pont de Nemours & Co., E. I., Wilmington, Del.
Electro Bleaching Gas Co., New York.
General Chemical Co., New York.
Hooker Electrochemical Co., New York.
Mathieson Alkali Works, Inc., New York.
Penna. Salt Mfg. Co., Philadelphia, Pa.

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Heine Chimney Co., Chicago, Ill.
Rust Engineering Co., Pittsburgh, Pa.
Weber Chimney Co., Chicago, Ill.

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American Chimney Corp., New York.
Alphons Custodis Chimney Const. Co., New York.
Heine Chimney Co., Chicago, Ill.
Heinicke, Inc., H. R., Indianapolis, Ind.

* *Indicates that the manufacturer carries an advertisement.* *See index facing inside back cover.*



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Standard since 1856

Adapted to all kinds of plain and ornamental plastering

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Rust Engineering Co., Pittsburgh, Pa.

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CHLORINATORS
*Wallace & Tiernan Co., Inc., Newark, N. J.

CHLORINE, LIQUID (See Liquid Chlorine)

CHUTES, CONCRETE
*Insley Mfg. Co., Indianapolis, Ind.
*Ransome Concrete Mchy. Co., Dunellen, N. J.
Lakewood Engineering Co., Cleveland, O.

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American Hoist & Derrick Co., St. Paul, Minn.
Marion Malleable Iron Works, Marion, Ind.
Mockbee & Co., C. M., Cincinnati, O.
Roebling Sons Co., J. A., Trenton, N. J.
Upson-Walton Co., Cleveland, O.

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*Good Roads Mach'y Co., Kennett Square, Pa.
*L. P. Green, Chicago, Ill.
*Haiss Mfg. Co., Geo., New York.
*Robins Conv. Belt Co., New York.
Barber-Greene Co., Aurora, Ill.
Bartlett & Snow Co., C. O. Cleveland, Ohio.
Brown Hoisting Mchy. Co., Cleveland, O.
Chain Belt Co., Milwaukee, Wis.
Fairfield Engineering Co., Lancaster, Ohio.
Gifford-Wood Co., Hudson, N. Y.
Hunt Co., Inc., C. W., West New Brighton, N. Y.
Jeffrey Mfg. Co., Columbus, O.
Kon-Wald Co., Buffalo, N. Y.
Lidgerwood Mfg. Co., New York.
Link-Belt Co., Chicago, Ill.
Mead-Morrison Mfg. Co., E. Boston, Mass.
Portable Machinery Co., Passaic, N. J.
Webster Mfg. Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

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*Union Water Meter Co., Worcester, Mass.
Chapman Valve Mfg. Co., Indian Orchard, Mass.
Glauber Brass Mfg. Co., Cleveland, Ohio.
Haydenville Co., Haydenville, Mass.
Mueller Company, Decatur, Ill.

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*Insley Mfg. Co., Indianapolis, Ind.
Phillips, Co., Victor L., Kansas City, Mo.
Sterling Wheelbarrow Co., Milwaukee, Wis.
Symons Clamp Co., Chicago, Ill.
Universal Form Clamp Co., Chicago, Ill.

COMPRESSORS, AIR (See Air Compressors)

CONCRETE FLOOR HARDENER
*Truscon Laboratories, Detroit, Mich.
Anti-Hydro Waterproofing Co., Newark, N. J.
General Chemical Co., New York.
General Fireproofing Co., Youngstown, Ohio.
Granitex Corp., New York.
Horn Co., A. C., Long Island City, N. Y.
Master Builders Co., Cleveland, O.
Sonneborn Sons, Inc., L., N. Y. "Lapidolith"

CONCRETE MIXERS
*American Cement Mchy. Co., Inc., Keokuk, Ia.
*Austin Machinery Corp'n, Toledo, O.
*Jaeger Machine Co., Columbus, O.
*Atlas Eng. Co., Milwaukee, Wis.
*Koehring Co., Milwaukee, Wis.
*Ransome Concrete Mchy. Co., Dunellen, N. J.
Badger Concrete Mixer Co., Milwaukee, Wis.
Chain Belt Co., Milwaukee, Wis.
Construction Mach'y Co., Waterloo, Iowa.
Contractors' Equipment Co., Keokuk, Ia.
Foote Concrete Mchy. Co., Chicago, Ill.
Gray Iron Fdry Co., Reading, Pa.
Judy Mfg. Co., Centerville, Ia.
Knickerbocker Co., Jackson, Mich.
Lakewood Engineering Co., Cleveland, O.
Lansing Co., Lansing, Mich.
Marsh-Capron Co., Chicago, Ill.
Milwaukee Concrete Mixer Co., Milwaukee, Wis.
Oshkosh Mfg. Co., Oshkosh, Wis.
Republic Iron Works, Tecumseh, Mich.
Schramm, Inc., West Chester, Pa.
Smith Co., T. L., Milwaukee, Wis.
Standard Scale & Supply Co., Pittsburgh, Pa.
Truckmixer Co., Milwaukee, Wis.
Worthington Pump & Mach'y Corp., New York.

CONCRETE PILING. (See Piling, Concrete)

CONCRETE REINFORCEMENT
*Truscon Steel Co., Youngstown O.
*Wickwire Spencer Steel Corp., New York.
American Steel & Wire Co., Chicago, Ill.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie Steel Co., Pittsburgh, Pa.
Concrete Steel Co., New York.
Consolidated Expanded Metal Co., Braddock, Pa.
Electric Welding Co., Pittsburgh, Pa.
General Fireproofing Co., Youngstown, O.
Inland Steel Co., Chicago, Ill.
Kalman Steel Co., Chicago, Ill.
National Steel Fabric Co., Pittsburgh, Pa.
Ryerson & Son, J. T., Chicago, Ill.
Youngstown Pressed Steel Co., Warren, O.
Youngstown Sheet & Tube Co., Youngstown, O.

CONCRETE ROAD FINISHERS
Dunn Road Mach. Co., Conneaut, Ohio.
French & Co., A. W., Chicago, Ill.
Heltzel Steel Form & Iron Co., Warren, O.
Lakewood Eng. Co., Cleveland, Ohio.

CONCRETE TOOLS
*Dallett Co., The, Philadelphia, Pa.

CONDENSERS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Dean Bros. Steam Pump Wks., Indianapolis, Ind.
Ingersoll-Rand Co., New York.
Westinghouse Elec. & Mfg. Co., E. Pittsb'gh, Pa.
Wheeler Condenser & Eng. Co., Carteret, N. J.
Worthington Pump & Mach'y Corp., New York

CONDUIT RODS
Bissell Co., F., Toledo, Ohio.
Turbine Sewer Machine Co., Milwaukee, Wis.
Waldo Bros. & Bond Co., Boston, Mass.

CONDUITS, INTERIOR
American Circular Loom Co., New York.
Central Tube Co., Pittsburgh, Pa.
Clifton Mfg. Co., Boston, Mass.
Garland Mfg. Co., W. Pittsburgh, Pa.
National Enam. & Mfg. Co., Pittsburgh, Pa.
National Metal Molding Co., Pittsburgh, Pa.
Pittsburgh Steel Co., Beaver, Pa.
Sprague Electric Wks., New York.
Steelduct Co., Youngstown, O.
Youngstown Sheet & Tube Co., Youngstown, O.

CONDUITS, UNDERGROUND
American Vitrified Products Co., Akron, Ohio.
Fibre Conduit Co., Orangeburg, N. Y.
Johns-Manville, Inc., New York.
National Fireproofing Co., New York.

CONTRACTORS' SUPPLY DEALERS
(See pages 103-119)

CONVEYORS, BELT
*Good Roads Mach'y Co., Kennett Square, Pa.
*Haiss Mfg. Co., Geo., New York.
*Russell Grader Mfg. Co., Minneapolis, Minn.
Barber-Greene Co., Aurora, Ill.
Chain Belt Co., Milwaukee, Wis.
Gifford Wood Co., Hudson, N. Y.
Jeffrey Mfg. Co., Columbus, O.
Link-Belt Co., Chicago, Ill.
Olson & Co., Sam'l, Chicago, Ill.
Portable Machinery Co., Passaic, N. J.
Robins Conv. Belt Co., New York.
Standard Conveyor Co., No. St. Paul, Minn.
Webster Mfg. Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

CONVEYORS, BUCKET
*Atlas Engineering Co., Milwaukee, Wis.
*Good Roads Mach'y Co., Kennett Square, Pa.
*Haiss Mfg. Co., Geo., New York.
*Russell Grader Mfg. Co., Minneapolis, Minn.
Bartlett & Snow Co., C. O., Cleveland, O.
Caldwell & Son, H. W., Chicago, Ill.
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Fairfield Engineering Co., Lancaster, Ohio.
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Erie Shovel Co. Use Williamsport Wire Rope as Standard Equipment on All Their Apparatus

Where you find a manufacturer protecting you by using

WILLIAMSPORT WIRE TELFAX TAPE MARKED ROPE

as standard equipment, you may feel assured they are worthy of your greatest consideration.

There's plenty of cheap Wire Rope on the market and it is usually wished on users when the manufacturer is anxious to make a long profit.

The very use of Williamsport ropes as standard equipment is an indication that the manufacturer wants you to have good, reliable equipment—and to KNOW you're getting it.

For "Williamsport" is the only wire rope made the grade of which can be positively identified.

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Williamsport Wire Rope Company

Main Office and Works:
Williamsport, Pa.

General Sales Office:
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Guarantee Constn. Co., New York.
Jeffrey Mfg. Co., Columbus, O.
Link-Belt Co., Chicago, Ill.
Mead-Morrison Mfg. Co., E. Boston, Mass.
Olson & Co., Sam'l, Chicago, Ill.
Republic Rubber Co., Youngstown, O.
Robins Conv. Belt Co., New York.
Stephens Adamson Mfg. Co., Aurora, Ill.
Webster Mfg. Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

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Dow Co., Louisville, Ky.
Lamson Co., Syracuse, N. Y.
Mathews Gravity Carrier Co., Elwood City, Pa.
Standard Conveyor Co., No. St. Paul, Minn.

CRANES, LOCOMOTIVE

*Koehring Co., Milwaukee, Wis.
*Osgood Co., The, Marion, O.
*Pawling & Harnischfeger Co., Milwaukee, Wis.
American Hoist & Derrick Co., St. Paul, Minn.
Brown Hoisting Mchy. Co., Cleveland, O.
Browning Co., Cleveland, O.
Bucyrus Co., South Milwaukee, Wis.
Byers Machine Co., Ravenna, O.
Davenport Locomotive Works, Davenport, Ia.
Erie Steam Shovel Co., Erie, Pa.
Hanna Eng. Works, Chicago, Ill.
Industrial Works, Bay City, Mich.
Link-Belt Co., Chicago, Ill.
Locomotive Crane Co. of America, Champaign, Ill.
Marion Steam Shovel Co., Marion, O.
McMyler Interstate Co., Cleveland, O.
Northwest Engineering Works, Chicago, Ill.
Orton & Steinbrenner Co., Chicago, Ill.
Ohio Locomotive Crane Co., Bucyrus, O.
Thew Shovel Co., Lorain, O.
U. S. Crane Co., Chicago, Ill.

CRANES, OVERHEAD TRAVELING

*Pawling & Harnischfeger Co., Milwaukee, Wis.
Alliance Machine Co., Alliance, O.
Chesapeake Iron Wks., Baltimore, Md.
Milwaukee Electric Crane Co., Milwaukee, Wis.
Morgan Engineering Co., Alliance, O.
Northern Eng. Works, Detroit, Mich.
Shaw Crane Works, Muskegon, Mich.
Shepard Elec. Cr. & Hst. Co., Montour Falls, N.Y.
Toledo Crane Co., Bucyrus, O.
Whiting Fdry. & Equip. Co., Harvey, Ill.

CRANES, WRECKING

Bucyrus Co., South Milwaukee, Wis.
Industrial Works, Bay City, Mich.

CREOSOTED BLOCKS, TIMBER, ETC.

American Creosoting Co., Inc., New York.
American Creosote Works, Inc., N. Orleans, La.
Carter Bloxonend Flooring Co., Kansas City, Mo.
Colonial Creosoting Co., Inc., New York.
Georgia Creosoting Co., New York.
Jennison-Wright Co., Toledo, O.
Midland Creosoting Co., Granite City, Ill.
Republic Creosoting Co., Indianapolis, Ind.
Southern Wood Pres. Co., Atlanta, Ga.
Wyckoff Pipe & Creosoting Co., New York.

CREOSOTING AND CREOSOTING OILS

Am. Creosote Wks., Inc., New Orleans, La.
American Tar Products Co., Chicago, Ill.
Barrett Co., New York.
Jennison-Wright Co., Toledo, O.
Southern Creosoting Co., Ltd., Slidell, La.
Southern Paving Const. Co., Chattanooga, Tenn.
Wyckoff Pipe & Creosoting Co., New York.

CRUSHERS, HEAVY DUTY

Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Buchanan Co., O. G., New York.
Traylor Eng. & Mfg. Co., Allentown, Pa.

CRUSHERS, ROCK

*Austin-Western Road Mach. Co., Chicago, Ill.
*Galion Iron Wks. & Mfg. Co., Galion, Ohio.
*Good Roads Machinery Co., Kennett Square, Pa.
*Universal Road Machinery Co., Kingston, N. Y.
Acme Road Machy. Co., Frankfort, N. Y.
Chalmers & Williams, Chicago Hts., Ill.
Morgan Engineering Co., Alliance, O.
New Holland Mach. Co., New Holland, Pa.
Smith Eng. Wks., Milwaukee, Wis.
Sturtevant Mill Co., Boston, Mass.
Universal Crusher Co., Cedar Rapids, Ia.

CULVERTS, CAST IRON

*U. S. C. I. Pipe & Fdry. Co., Burlington, N. J.
American Cast Iron Pipe Co., Birmingham, Ala.
Gilbert Mfg. Co., Aberdeen, S. D.
Wood & Co., R. D., Philadelphia, Pa.

CULVERTS, CORRUGATED METAL

*Austin-Western Rd. Mach. Co., Chicago, Ill.
*Galion Iron Works & Mfg. Co., Galion, Ohio.
*Good Roads Machinery Co., Kennett Square, Pa.
*Newport Culvert Co., Newport, Ky.
Canton Culvert & Silo Co., Canton, O.
Dominion Metal Products Corp., Roanoke, Va.
Florida Metal Products Co., Jacksonville, Fla.
Gilbert Mfg. Co., Aberdeen, S. D.
Hardesty Mfg. Co., The R., Denver, Colo.
Klauer Mfg. Co., Dubuque, Ia.
Lyle Culv. & Rd. Equip. Co., Minneapolis, Minn.
Southern Metal Culvert Co., Salisbury, N. C.
Wheeling Corrugating Co., Wheeling, W. Va.

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*Clark Co., H. W., Mattoon, Ill.
Casey-Hedges Co., Chattanooga, Tenn.
Clow & Sons, J. B., Chicago, Ill.
Madison Foundry Co., Cleveland, O.
Mueller Co., Decatur, Ill.

CURB GUARDS, STEEL

*Godwin Co., W. S., Baltimore, Md.

CURB, STEEL PROTECTED

*Truscon Steel Co., Youngstown, O.
Concrete Steel Co., New York.
Steel Protected Concrete Co., Philadelphia, Pa.

CUTTERS, PIPE, HAND

Armstrong Mfg. Co., Bridgeport, Conn.
Erie Tool Works, Erie, Pa.
Greenfield Tap & Die Corp'n., Greenfield, Mass.
Oswego Tool Co., Oswego, N. Y.
Reed Mfg. Co., Erie, Pa.
Walworth Mfg. Co., Boston, Mass.

CUTTERS, ROD AND WIRE

*Koehring Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Carolus Mfg. Co., Sterling, Ill.
Helwig Mfg. Co., St. Paul, Minn.
Worthington Pump & Mchy. Corp., New York.

CUTTING EDGES

*Adams & Co., J. D., Indianapolis, Ind.
*Shunk Mfg. Co., Bucyrus, O.

CUTTING AND WELDING APPARATUS

MacLeod Co., Cincinnati, O.
Milburn Co., Alexander, Baltimore, Md.

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*Insley Mfg. Co., Indianapolis, Ind.
American Hoist & Derrick Co., St. Paul, Minn.
Clyde Iron Wks. Sales Co., Duluth, Minn.
Dobbie Fdry. & Mach. Co., Niagara Falls, N. Y.
Federal Bridge & Struc. Co., Waukesha, Wis.
Flory Mfg. Co., S., Bangor, Pa.
Horton Co., John T., New York.
Lakeside Bridge & Steel Co., N. Milwaukee, Wis.
Lidgerwood Manufacturing Co., New York.
National Hoisting Engine Co., Harrison, N. J.
Sasgen Derrick Co., Chicago, Ill.
Superior Iron Works, Superior, Wis.

DERRICKS, PIPE LAYING

Austin Machinery Corp'n, Toledo, O.
Dobbie Fdry. & Mach. Co., Niagara Falls, N. Y.



Laying 90 Feet of Concrete An Hour with 22 Ford Trucks

Here is another instance where the Ford One-Ton Truck has proved its usefulness on highway construction work. A contract for 24 miles of concrete, 18 feet wide, on the Sni-Bar Road, in Jackson County, Missouri, was awarded to the W. A. Ross Construction Company, of Kansas City.

"On this job we used 22 Ford One-Ton Trucks equipped with dump bodies, and found them very satisfactory," states W. A. Ross, president.

"In spite of the unfavorable weather conditions last season—there being only 72 days we could work from July to November—we finished all of the dirt work and nine miles of the concrete. We used two mixers with portable loaders and 11 trucks, working from each end of the nine mile stretch. With this equipment we put in as much as 90 feet of road an hour.

"Due to the heavy grades the use of an industrial railroad was out of the question, while trucks heavier than Fords would have cut up the sub-grade. Ford One-Ton Trucks gave us better service on this job than any other method of hauling."

Contractors and builders everywhere are showing a marked preference for Ford One-Ton Trucks.

Any Authorized Ford Dealer has facts and figures that will show you how you can profitably Fordize your business.

One-Ton Truck Chassis, $370 F.O.B. Detroit

Starter $65 Extra

Ford

CARS · TRUCKS · TRACTORS

FV61

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Mueller Co., Decatur, Ill.
Lidgerwood Manufacturing Co., New York.

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Dobbie Fdry. & Mach. Co., Niagara Falls, N. Y.
Lidgerwood Mfg. Co., New York.

DERRICKS, STEEL

*Insley Mfg. Co., Indianapolis, Ind.
*Pawling & Harnischfeger Co., Milwaukee, Wis.
American Hoist & Derrick Co., St. Paul, Minn.
Austin Machinery Corp'n, Toledo, O.
Buffalo Hoist and Derrick Co., Buffalo, N. Y.
Clyde Iron Works Sales Co., Duluth, Minn.
Dobbie Fdry. & Mach. Co., Niagara Falls, N. Y.
Hayward Co., New York.
Lakeside Bridge & Steel Co., N. Milwaukee, Wis.
Lidgerwood Manufacturing Co., New York.
Taylor Portable Steel Derrick Co., Chicago, Ill.

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Clyde Iron Works Sales Co., Duluth, Minn.
Dobbie Fdry. & Mach. Co., Niagara Falls, N. Y.
Lidgerwood Manufacturing Co., New York.

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Austin Machinery Corp'n, Toledo, O.
Bay City Dredge Works, Bay City, Mich.
Clyde Iron Works Sales Co., Duluth, Minn.
Dobbie Fdry. & Mach. Co., Niagara Falls, N. Y.
Hayward Co., New York.
Nat'l Hoisting Engine Co., Harrison, N. J.
Orton & Steinbrenner Co., Chicago, Ill.

DIESEL ENGINES. (See Engines, Oil)

DISTRIBUTORS, TAR AND ASPHALT

*Kinney Mfg. Co., Boston, Mass.

DISTRIBUTING PLANTS, CONCRETE

*Insley Mfg. Co., Indianapolis, Ind.
*Koehring Co., Milwaukee, Wis.
*Ransome Concrete Mchy. Co., Dunellen, N. J.
Archer Iron Works, Chicago, Ill.
Lakewood Engineering Co., Cleveland, O.

DITCHING MACHINES. (See Excavators, Ditch and Trench)

DIVIDING PLATES (ROAD)

*Godwin Co., W. S., Baltimore, Md.

DOORS, HOLLOW METAL

Dahlstrom Metallic Door Corp., Jamestown, N. Y.
Lawton-Stephens Co., Brooklyn, N. Y.
McFarland Co., J. C., La Porte, Ind.
United Metal Products Co., Canton, Ohio.

DOORS, METAL (KALAMEIN)

Friedrich Co., E. H. Holyoke, Mass.
Penn Metal Co., Boston, Mass.
Riester & Theumacher Co., Cleveland, Ohio.
Sykes Co., Chicago, Ill.
Thorp Fireproof Door Co., Minneapolis, Minn.

DOORS AND SHUTTERS, STEEL ROLLING

Cornell Iron Works, Inc., New York.
Kinnear Mfg. Co., Columbus, O.
Variety Fire Door Co., Chicago, Ill.
Wilson Corp., J. G., New York.

DRAFTING MACHINES

Universal Drafting Machine Co., Cleveland, O.

DREDGES

*Michigan Dredge Co., Bay City, Mich.
*Osgood Co., The, Marion, O.
American Steel Dredge Co., Fort Wayne, Ind.
Bay City Dredge Works, Bay City, Mich.
Bucyrus Co., South Milwaukee, Wis.
Ellicott Machine Corp'n, Baltimore, Md.
Erie Steam Shovel Co., Erie, Pa.
Hayward Co., New York.
Lidgerwood Mfg. Co., New York.
Marion Steam Shovel Co., Marion, O.
Stockton Iron Works, Stockton, Cal.
Street Bros. Machine Works, Chattanooga, Tenn.
Superior Iron Works, Superior, Wis.
Vulcan Iron Works, Jersey City, N. J.

DREDGES, DIPPER

American Steel Dredge Co., Fort Wayne, Ind.
Austin Machinery Corp'n, Toledo, O.
Bay City Dredge Works, Bay City, Mich.
Bucyrus Co., South Milwaukee, Wis.
Fairbanks Steam Shovel Co., Marion, O.
Marion Steam Shovel Co., Marion, O.
Osgood Co., Marion, O.

DREDGES, HYDRAULIC

Bucyrus Co., South Milwaukee, Wis.
Ellicott Mach. Corp., Baltimore, Md.
Fairbanks Steam Shovel Co., Marion, O.
Marion Steam Shovel Co., Marion, O.
Morris Machine Works, Baldwinsville, N. Y.

DREDGING PUMPS AND ACCESSORIES

Erie Pump & Engine Wks., Medina, N. Y.

DRILLS, AIR AND ROCK

*Dallett Co., The, Philadelphia, Pa.
*Denver Rock Drill Mfg. Co., Denver, Colo.
*McKiernan-Terry Drill Co., New York.
Chicago Pneumatic Tool Co., New York.
Cleveland Pneumatic Tool Co., Cleveland, Ohio.
Cleveland Rock Drill Co., Cleveland, Ohio.
Helwig Mfg. Co., St. Paul, Minn.
Independent Pneumatic Tool Co., Chicago, Ill.
Ingersoll-Rand Co., New York.
Sullivan Machinery Co., Chicago, Ill.

DRILLS, CORE

*McKiernan-Terry Drill Co., New York.
Dobbins Core Drill Co., Inc., New York.
Ingersoll-Rand Co., New York.
Standard Diamond Drill Co., Chicago, Ill.
Sullivan Mach'y Co., Chicago, Ill.

DRILLS, HAMMER (PNEUMATIC)

*Denver Rock Drill Mfg. Co., Denver, Colo.
*McKiernan-Terry Drill Co., New York.
Chicago Pneumatic Tool Co., New York.
Cleveland Pneumatic Tool Co., Cleveland, O.
Cleveland Rock Drill Co., Cleveland, O.
Ingersoll-Rand Co., New York.
Sullivan Machinery Co., Chicago, Ill.

DRILLS FOR WELLS AND BLAST HOLES
(See Well Drilling Machinery)

DRUMS, HOLDING

*Blaw-Knox Co., Pittsburgh, Pa.
Clyde Iron Works Sales Co., Duluth, Minn.
Dobbie Fdry. & Mach. Co., Niagara Falls, N. Y.
Hayward Co., New York.
Monighan Machine Co., Chicago, Ill.

DRYERS, ASPHALT AND CEMENT

*East Iron & Machine Co., Lima, Ohio.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Blower Co., Detroit, Mich.
American Process Co., New York.
Atlas Dryer Co., Cleveland, O.
Bartlett & Snow Co., C. O., Cleveland, O.
Cummer & Son Co., F. D., Cleveland, O.
Ruggles-Coles Eng. Co., New York.

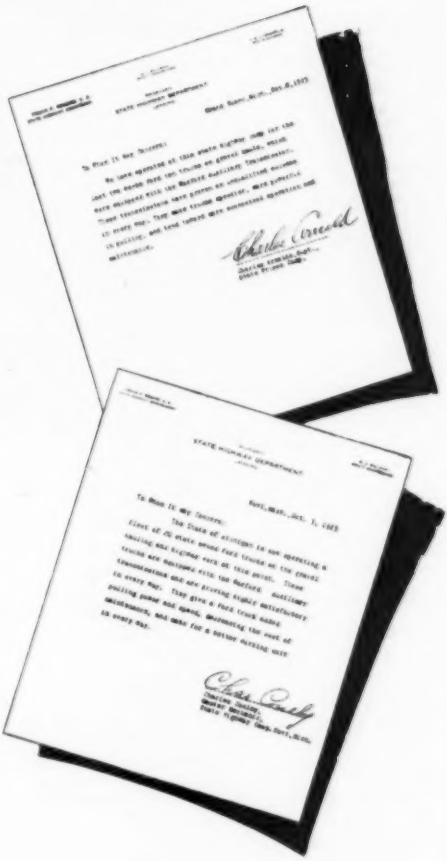
DRYERS, SAND AND GRAVEL

*Littleford Bros., Cincinnati, Ohio.

DUMP BODIES FOR MOTOR TRUCKS

*Heil Company, Milwaukee, Wis.
*Insley Mfg. Co., Indianapolis, Ind.
*International Motor Co., New York.
*Littleford Bros., Cincinnati, O.
Archer Iron Works, Chicago, Ill.
Columbia Body Corp., Columbia, Pa.
Columbian Steel Tank Co., Kansas City, Mo.
Griscom-Russell Co., New York.
Jennings Automatic Dump Body, Roanoke, Va.
Lee Trailer & Body Co., Chicago, Ill.





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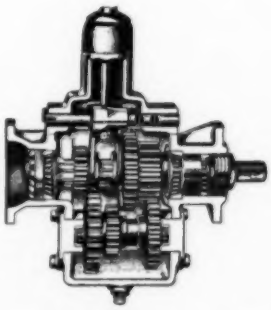
The fact that the State of Michigan endorses the Warford Auxiliary Transmission is something for you to think about.

These appreciations, coming as they do from the very heart of the automotive industry, are significant.

Besieged and surrounded by the makers of trucks and truck equipment of all sorts, with the latest achievements of the industry to choose from, with its years of experience to guide it, the Michigan Highway Department has chosen Warford.

Not only in Michigan, but throughout the country, in the mountain grades of Colorado and on the plains of Iowa, road builders are enthusiastic in their praise of Warford. This six-speed selective type transmission gives them speedy two-ton performance *with Ford one-ton economy.*

Every Warford is sold conditionally. It must meet your hauling problems to your satisfaction, or you get your money back. Ask your Ford dealer or write us.



"A Speed for Every Need"

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Mandt Body Co., Keokuk, Iowa.
Pechstein Iron Works, Keokuk, Iowa.
Van Dorn Iron Wks., Cleveland, Ohio.
Wood Hydr. Hoist & Body Co., Detroit, Mich.
(Horizontal Hydr. Hoist Co., Detroit, Mich.)

DUMP CARTS AND WAGONS, HORSE DRAWN

***Austin-Western Road Machy. Co., Chicago, Ill.**
***Russell Grader Mfg. Co., Minneapolis, Minn.**
Acme Road Machinery Co., Frankfort, N. Y.
Acme Wagon Co., Emigsville, Pa.
Austin Mfg. Co., Chicago, Ill.
Columbia Body Corp., Columbia, Pa.
Convertible Wagon-Trailers, Inc., Buffalo, N. Y.
Eagle Wagon Works, Auburn, N. Y.
Gilbert Mfg. Co., Aberdeen, S. D.
Holzbog & Bro., Geo. H., Jeffersonville, Ind.
Little Red Wagon Co., Omaha, Neb.
Tiffin Wagon Co., Tiffin, Ohio.
Watson Products Corp., Canastota, N. Y.
Western Wheeled Scraper Co., Aurora, Ill.

DUST LAYING (CALCIUM CHLORIDE)

***Dow Chemical Co, Midland, Mich.**
***Solvay Process Co., Syracuse, N. Y.**
Carbondale Calcium Co., Carbondale, Pa.

DYNAMITE (See Explosives)

EJECTORS, SEWAGE (See Sewage Ejectors)

ELECTRIC GENERATORS AND MOTORS

Louis Allis Co., Milwaukee, Wis.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Crocker-Wheeler Co., Ampere, N. J.
Fairbanks, Morse & Co., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Idea Elec. & Mfg. Co., Mansfield, O.
Lincoln Electric Co., Cleveland, O.
Robbins & Myers Co., Springfield, O.
Triumph Electric Co., Cincinnati, O.
Wagner Elec. Mfg. Co., St. Louis, Mo.
Western Electric Co., New York.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

ELECTRIC LAMPS

General Electric Co., Schenectady, N. Y.
Westinghouse Lamp Co., New York.

ELECTRIC LIGHTING PLANTS

***Climax Engineering Co., Clinton, Ia.**
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Fairbanks, Morse & Co., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Universal Motor Co., Oshkosh, Wis.
Westinghouse Elec. & Mfg. Co., E. Pittsb'gh, Pa.
Western Electric Co., New York.

ELECTRIC SUPPLIES, METERS, ETC.

Bissell Co., F., Toledo, Ohio.
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., E. Pittsb'gh, Pa.

ELECTRIC TRANSFORMERS

Allis-Chalmers Mfg. Co., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.
Kuhlman Electric Co., Bay City, Mich.
Westinghouse Elec. & Mfg. Co., E. Pittsb'gh, Pa.

ELECTRIC WIRES AND CABLES. (See "Wire and Cable")

ELEVATORS, BUCKET

***Atlas Eng. Co., Milwaukee, Wis.**
***Austin-Western Road Machy. Co., Chicago, Ill.**
***Good Roads Mach'y Co., Kennett Square, Pa.**
***Haiss Mfg. Co., Geo., New York.**
***Littleford Bros., Cincinnati, Ohio.**
***Russell Grader Mfg. Co., Minneapolis, Minn.**
***Universal Road Machinery Co., Kingston, N. Y.**
Austin Mfg. Co., Chicago, Ill.
Bartlett & Snow Co., C. O., Cleveland, O.
Chain Belt Co., Milwaukee, Wis.
Fairfield Engineering Co., Lancaster, Ohio.
Gifford-Wood Co., Hudson, N. Y.
Jeffrey Mfg. Co., Columbus, O.
Link-Belt Co., Chicago, Ill.
Olson & Co., Sam'l, Chicago, Ill.
Robins Conv. Belt Co., New York.
Webster Mfg. Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.
Worthington Pump & Mchy. Corp., New York.

ELEVATORS, PASSENGER, FREIGHT, ETC.

Amer. Elevator & Mach. Co., Louisville, Ky.
Atlantic Elevator Co., Inc., Philadelphia, Pa.
Bay State Elevator Co., Springfield, Mass.
Haughton Elev. & Mach. Co., Toledo, Ohio.
Kaestner & Hecht Co., Chicago, Ill.
Llewellyn Iron Works, Los Angeles, Cal.
Montgomery Elevator Co., Moline, Ill.
Otis Elevator Co., New York.
Ridgeway & Son Co., C., Coatesville, Pa.
See Elec. Elevator Co., A. B., New York.
Speidel, J. G., Reading, Pa.
Warner Elevator Mfg. Co., Cincinnati, O.
Warsaw Elevator Co., Warsaw, N. Y.

ENGINES, GAS AND GASOLINE

***Climax Engineering Co., Clinton, Ia.**
***Hercules Corpn., Evansport, Ind.**
***Holt Mfg. Co., Peoria, Ill.**
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Buda Co., Harvey, Ill.
C. H. & E. Manufacturing Co., Milwaukee, Wis.
Charter Gas Eng. Co., Sterling, Ill.
Chicago Pneumatic Tool Co., New York.
Domestic Engine & Pump Co., Shippensburg, Pa.
Evinrude Motor Co., Milwaukee, Wis.
Fairbanks, Morse & Co., Chicago, Ill.
Foos Gas Engine Co., Springfield, Ohio.
Fuller & Johnson Mfg. Co., Madison, Wis.
Gade Bros. Mfg. Co., Iowa Falls, Iowa.
John Lauson Mfg. Co., New Holstein, Wis.
Le Roi Co., Milwaukee, Wis.
"New-Way" Motor Co., Lansing, Mich.
Novo Engine Co., Lansing, Mich.
Universal Motor Co., Oshkosh, Wis.
Weber Engine Co., Kansas City, Mo.
Wellman-Seaver-Morgan Co., Cleveland, O.
Worthington Pump & Mchy. Corp., New York.

ENGINES, OIL

DIESEL

Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Busch-Sulzer Bros.-Diesel Eng. Co., St. Louis, Mo.
Fulton Iron Works Co., St. Louis, Mo.
Hadfield-Penfield Steel Co., Bucyrus, Ohio.
McIntosh & Seymour Corp., Auburn, N. Y.
Norberg Mfg. Co., Milwaukee, Wis.
Western Machy. Co., Los Angeles, Cal.

SEMI-DIESEL

Anderson Fdry. & Mach. Co., Anderson, Ind.
Bessemer Gas Eng. Co., Grove City, Pa.
Buckeye Machinery Co., Lima, O.
Charter Gas Eng. Co., Sterling, Ill.
Chicago Pneumatic Tool Co., New York.
De La Vergne Machine Co., New York.
Fairbanks, Morse & Co., Chicago, Ill.
Foos Gas Engine Co., Springfield, Ohio.
Ingersoll-Rand Co., New York.
Midwest Engine Co., Indianapolis, Ind.
Muncie Oil Eng. Co., Muncie, Ind.
Norberg Mfg. Co., Milwaukee, Wis.
St. Mary's Oil Eng. Co., St. Charles, Mo.
Stover Mfg. & Engine Co., Freeport, Ill.
Taylor Machine Co., Cleveland, O.
Weber Engine Co., Kansas City, Mo.
Worthington Pump & Mchy. Corp., New York.

ENGINES, PUMPING

***Climax Engineering Co., Clinton, Ia.**
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Hooven, Owen, Rentschler Co., Hamilton, O.
Murray Iron Wks., Burlington, Ia.
Norberg Mfg. Co., Milwaukee, Wis.
Worthington Pump & Mchy. Corp., New York.

ENGINES, STEAM

Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Dake Engine Co., Grand Haven, Mich.
Erie-Ball Engine Co., Pittsburgh, Pa.
Erie Pump & Engine Co., Medina, N. Y.



"Even Greater Building Activity in 1924"

Are you Ready For It?



A CONTINUATION of building on even a greater scale than in 1923 is predicted for 1924. Billions of dollars will be spent this year to overcome the tremendous shortage in buildings that still exists.

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It is infringement to make, use or sell a patented invention without authority under the patent. Our patents have been sustained by the United States Courts in six different instances. Purchasers of our Mixers are protected.

The Jaeger catalog gives you a true picture of the latest, most advanced methods of concrete mixer designing and building. It tells you why the Jaeger Tilting-Drum means quicker, better mixing—how bigger capacity is obtained with less weight—how the tilting drum eliminates complicated construction. It takes you through a long chain of improvements covering every vital unit in concrete mixer construction.

The Jaeger line is complete—24 outfits, all with the famous Jaeger Tilting-Drum. Don't make the mistake of thinking that all tilting-drum mixers are Jaegers. There is a big difference. You want the genuine Jaeger, the leading concrete mixer. WRITE TODAY FOR CATALOG.

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Filer-Stowell Co., Milwaukee, Wis.
Hardie-Tynes Mfg. Co., Birmingham, Ala.
Leffel Co., J., Springfield, O.
Morris Machine Works, Baldwinsville, N. Y.
Murray Iron Works Co., Burlington, Ia.
Norberg Mfg. Co., Milwaukee, Wis.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Vilter Mfg. Co., Milwaukee, Wis.

EXCAVATING MACHINERY. (See Names Under Excavators, also Steam Shovels)

EXCAVATORS, CABLEWAY

Bucyrus Co., South Milwaukee, Wis.
Lidgerwood Mfg. Co., New York.

EXCAVATORS, DITCH AND TRENCH

***Insley Mfg. Co., Indianapolis, Ind.**
***Keystone Driller Co., Beaver Falls, Pa.**
***Osgood Co., The, Marion, O.**
***Pawling & Harnischfeger Co., Milwaukee, Wis.**
***Russell Grader Mfg. Co., Minneapolis, Minn.**
American Hoist & Derrick Co., St. Paul, Minn.
Austin Machinery Corp'n, Toledo, O.
Bay City Dredge Works, Bay City, Mich.
Byers Machine Co., Ravenna, Ohio.
Buckeye Traction Ditcher Co., Findlay, Ohio.
Bucyrus Co., South Milwaukee, Wis.
Clyde Iron Works Sales Co., Duluth, Minn.
Economy Excavator Co., Iowa Falls, Ia.
Erie Steam Shovel Co., Erie, Pa.
Fairbanks Steam Shovel Co., Marion, O.
Hayward Co., The, New York City.
Marion Steam Shovel Co., Marion, O.
Monighan Machine Co., Chicago, Ill.
Parsons Co., Newton, Ia.
Topping Machy. Co., Chas. T. Dayton, O.

EXCAVATORS, DRAG-LINE

***Bay City Dredge Works, Bay City, Mich.**
***Green, L. P., Chicago, Ill.**
***Osgood Co., The, Marion, O.**
***Pawling & Harnischfeger Co., Milwaukee, Wis.**
***Sauerman Bros., Chicago, Ill.**
Austin Machinery Corp'n, Toledo, O.
Browning Co., Cleveland, O.
Bucyrus Co., South Milwaukee, Wis.
Byers Machine Co., Ravenna, Ohio.
Clyde Iron Works Sales Co., Duluth, Minn.
Economy Excavator Co., Iowa Falls, Ia.
Erie Steam Shovel Co., Erie, Pa.
Gade Excavator Works, C. L., Iowa Falls, Iowa.
Hayward Co., New York.
Industrial Works, Bay City, Mich.
Link-Belt Co., Chicago, Ill.
Marion Steam Shovel Co., Marion, O.
Monighan Machine Co., Chicago, Ill.
Parsons Co., Newton, Ia.
Smith Co., T. L., Milwaukee, Wis.

EXPANDED METAL

***Truscon Steel Co., Youngstown, O.**
Berger Mfg. Co., Canton, O.
Consolidated Expanded Metal Co., Braddock, Pa.
Kalman Steel Co., Chicago, Ill.
Northwestern Expanded Metal Co., Chicago, Ill.
Youngstown Pressed Steel Co., Warren, O.

EXPANSION JOINT MATERIAL

***Barber Asphalt Co., Philadelphia, Pa.**
***Carey Co., Philip, Cincinnati, Ohio.**
***Texas Company, New York.**
***Truscon Steel Co., Youngstown, O.**
***Waring-Underwood Co., Philadelphia, Pa.**
Asphalt Products Co., Coatesville, Pa.
Barrett Co., New York.
Pioneer Asphalt Co., Lawrenceville, Ill.

EXPLOSIVES

Atlas Powder Co., Wilmington, Del.
Du Pont de Nemours & Co., E. I., Wilmington, Del.
Giant Powder Co., Cons., San Francisco, Cal.
Grasselli Powder Co., Cleveland, O.
Hercules Powder Co., Wilmington, Del.

FENCING

***Wickwire Spencer Steel Corp., New York.**
Adrian Wire Fence Co., Adrian, Mich.
American Steel & Wire Co., Chicago, Ill.
Anchor Post Iron Works, New York.
Cyclone Fence Co., Waukegan, Ill.
Frost-Superior Fence Co., Cleveland, O.
Indiana Steel & Wire Co., Muncie, Ind.
Nitselman Bros., Muncie, Ind.
Michigan Wire Fence Co., Adrian, Mich.
Page Steel & Wire Prod. Corp., Bridgeport, Conn.
Pittsburgh Steel Co., Pittsburgh, Pa.
Stewart Iron Works Co., Cincinnati, Ohio.
Texas Cyclone Fence Co., Fort Worth, Tex.
Youngstown Sheet & Tube Co., Youngstown, O.

FILING EQUIPMENT, STEEL

Art Metal Constr. Co., Jamestown, N. Y.
Berger Mfg. Co., Canton, O.
General Fireproofing Co., Youngstown, O.
Van Dorn Iron Works, Cleveland, O.

FILTERS, OIL

Bowser & Co., Inc., S. F., Fort Wayne, Ind.
Wayne Tank & Pump Co., Ft. Wayne, Ind.

FILTERS, WATER

American Water Softener Co., Philadelphia, Pa.
Graver Corporation, E. Chicago, Ind.
International Filter Co., Chicago, Ill.
N. Y. Continental Jewel Filtr. Co., Nutley, N. J.
Norwood Engineering Co., Florence, Mass.
Roberts Filter Co., Darby, Pa.
Scaife & Sons Co., W. B., Pittsburgh, Pa.

FIRE ALARM SYSTEMS

Gamewell Fire Alarm Tel. Co., Newton Upper Falls, Mass.

FIRE ALARM SIRENS

Erick Elec. Siren Co., St. Paul, Minn.
Federal Sign System, Chicago, Ill.
Hendrie & Bolthoff Mfg. & Sup. Co., Denver, Col.
Interstate Machine Prod. Co., Rochester, N. Y.
Sireno Co., Stapleton, N. Y.
Union Water Meter Co., Worcester, Mass.

FIRE APPARATUS, MOTOR

***International Motor Co., New York.**
Ahrens-Fox Fire Engine Co., Cincinnati, O.
American-La France Fire Eng. Co., Elmira, N. Y.
Brockway Motor Fire App. Co., Cortlandt, N. Y.
Foamite-Childs Corp., Utica, N. Y.
Hale Fire Pump Co., Conshohocken, Pa.
Northern Fire Apparatus Co., Minneapolis, Minn.
Obenchain-Boyer Co., Logansport, Ind.
Pirsch & Sons Co., Peter, Kenosha, Wis.
Prospect Fire Engine Co., Prospect, O.
Seagrave Co., Columbus, O.
Stutz Fire Engine Co., Indianapolis, Ind.
Waterous Fire Engine Works, St. Paul, Minn.

FIRE EXTINGUISHERS, CHEMICAL

American-La France Fire Eng. Co., Elmira, N. Y.
Buffalo Fire Appliance Corp., Buffalo, N. Y.
Cross Mfg. Co., C. J., Inc., New York.
Foamite-Childs Co., Utica, N. Y.
Pyrene Mfg. Co., Newark, N. J.

FIRE HOSE (See Hose, Fire)

FIREPROOF BUILDING MATERIAL

***Truscon Steel Co., Youngstown, O.**
Berger Mfg. Co., Canton, O.
Detroit Steel Prod. Co., Detroit, Mich.
General Fireproofing Co., Youngstown, O.
Kalman Steel Co., Chicago, Ill.
Keasbey & Mattison Co., Ambler, Pa.
Kinnear Mfg. Co., Columbus, O.
National Fireproofing Co., Pittsburgh, Pa.
United States Gypsum Co., Chicago, Ill.
Youngstown Pressed Steel Co., Warren, O.

FIRST AID EQUIPMENT

American-La France Fire Eng. Co., Elmira, N. Y.

FLEXIBLE JOINTS

***Century Foundry Co., New York.**
***U. S. C. I. Pipe & Fdry Co., Burlington, N. J.**
Coldwell-Wilcox Co., Newburgh, N. Y.
Crane Co., Chicago, Ill.
Lunkenheimer Co., Cincinnati, O.
United Lead Company, New York.

FLOORING, COMPOSITION

***Barber Asphalt Co., Philadelphia, Pa.**
Am. Mason Safety Tread Co., Lowell, Mass.

** Indicates that the manufacturer carries an advertisement. See index facing inside back cover.*

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Old macadam street at Bedford, Ind. before and after surfacing with Kyrock

New Roads for Old

Kyrock converts old macadam, gravel, brick, asphalt and concrete roadways into the highest type heavy duty pavements—often at one-half the cost of new construction.

Kyrock is shipped ready to lay cold on any standard base. Shovels, rakes and rollers are the only equipment required. No asphalt experts are needed. The finished Kyrock pavement is smooth, noiseless, dustless and resilient, the same in appearance as the finest sheet asphalt. Unlike the hot mix asphalts, however, Kyrock will not shove, roll, buckle or bleed. It will not crack in winter or rut in summer.

Our engineering department has prepared standard specifications for Kyrock construction and re-construction on all standard bases. Literature on request. Ask for booklet C.E.M.

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Incorporated

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Barrett Co., New York.
Johns-Manville, Inc., New York.
Marine Decking & Supply Co., Phila., Pa.
Muller, Franklyn R., & Co., Waukegan, Ill.

FLOORS, WOOD BLOCK

*Barrett Co., New York.
Carter Bloxonend Flooring Co., Kansas City, Mo.
Jennison-Wright Co., Toledo, O.
Midland Creosoting Co., Toledo, O.
Republic Creosoting Co., Indianapolis, Ind.
Sou. Wood Preserving Co., Atlanta, Ga.
Wyckoff Pipe & Creosoting Co., New York.

FLUSH TANKS

Pacific Flush Tank Co., Chicago, Ill.

FLUSHERS, STREET. (See Street Flushers and Sprinklers.)

FORGES

Buffalo Forge Co., Buffalo, N. Y.
Hauck Mfg. Co., Brooklyn, N. Y.

FORM CLAMPS

*Insley Mfg. Co., Indianapolis, Ind.
Marion Malleable Iron Works, Marion, Ind.
Universal Form Clamp Co., Chicago, Ill.

FORMS, CONCRETE

*Blaw-Knox Co., Pittsburgh, Pa.
*Connery & Co., Philadelphia, Pa.
*Truscon Steel Co., Youngstown, O.
Concrete Form Co., Inc., Syracuse, N. Y.
Heltzel Steel Form & Iron Co., The, Warren, O.
Lakewood Eng. Co., Cleveland, Ohio.
Metal Forms Corp., Milwaukee, Wis.

FOUNTAINS, DRINKING

Casey-Hedges Co., Chattanooga, Tenn.
Clow & Sons, Jas. B., Chicago, Ill.
Crane Co., Chicago, Ill.
Mott Iron Wks., J. L., New York.
Murdock Mfg. & Supply Co., Cincinnati, Ohio.
Puro San. Dr. Ftn. Co., Haydenville, Mass.
Rundle-Spence Mfg. Co., Milwaukee, Wis.
Stewart Iron Works Co., Cincinnati, O.
Taylor Co., Halsey W., Warren, O.
Twentieth Century Brass Wks., Belleville, Ill.

FURNITURE AND FILES, STEEL

Art Metal Constn. Co., Jamestown, N. Y.
General Fireproofing Co., Youngstown, O.
Van Dorn Iron Works Co., Cleveland, O.

GARBAGE CANS. (See Cans)

GARBAGE DISPOSAL

American Beccari Corp., New York.
Balmer Corp., New York.
Bartlett, C. O. & Snow Co., Cleveland, O.
Decarie Incinerator Co., Long Island City, N. Y.
Jones & Very, New York.
Morse-Boulger Destructor Co., New York.
Nye Odorless Crematory Co., Macon, Ga.

GARBAGE TRUCKS AND BODIES

*Heil Co., Milwaukee, Wis.
Convertible Wagon-Trailers, Inc., Buffalo, N. Y.
Holzbog & Bro., Geo. H., Jeffersonville, Ind.
Lee Trailer & Body Co., Chicago, Ill.
Tiffin Wagon Co., Tiffin, O.
Watson Products Corp., Canastota, N. Y.

GAS METERS. (See Meters, Gas.)

GAS PRODUCERS

Westinghouse Elec. & Mfg. Co., E. Pittsb'gh, Pa.
Wood & Co., R. D., Philadelphia, Pa.

GASOLINE STORAGE TANKS

*Heil Co., Milwaukee, Wis.
*Littleford Bros., Cincinnati, O.
Biggs Boiler Works, Akron, Ohio.
Bowser & Co., Inc., S. F., Fort Wayne, Ind.
Byers Machine Co., Ravenna, Ohio.
Chicago Bridge & Iron Works, Chicago, Ill.
Graver Corp., East Chicago, Ind.
Scaife & Sons, Wm. B., Oakmont, Pa.
Tokheim Oil Tank & Pump Co., Ft. Wayne, Ind.
United Iron Works, Kansas City, Mo.
Wayne Tank & Pump Co., Ft. Wayne, Ind.

GATES, SLUICE

*Ludlow Valve Mfg. Co., Troy, N. Y.
Chapman Valve Mfg. Co., Indian Orchard, Mass.
Coffin Valve Co., Boston, Mass.
Coldwell-Wilcox Co., Newburgh, N. Y.
Hardesty Mfg. Co., R., Denver, Colo.

GATES FOR PARKS AND CEMETERIES

*Wickwire Spencer Steel Corp., Worcester, Mass.
Stewart Iron Wks. Co., Cincinnati, O.

GAUGES, WATER

Bristol Co., Waterbury, Conn.
Lunkenheimer Co., Cincinnati, O.
Walworth Mfg. Co., Boston, Mass.

GAUGES, SURFACE, RESERVOIR AND SPECIAL WATER-WORKS

*Clark Co., H. W. Mattoon, Ill.
Builders Iron Foundry, Providence, R. I.
Simplex Valve & Meter Co., Philadelphia, Pa.

GLASS, FIREPROOF. (See Wire Glass.)

GRADERS, ROAD (See "Road Graders.")

GRADER BLADES

*Shunk Mfg. Co., Bucyrus, Ohio.
Adams & Co., J. D., Indianapolis, Ind.

GRAND STANDS, PORTABLE

Leavitt Mfg. Co., Urbana, Ill.
Wayne Iron Wks., Philadelphia, Pa.

GRINDERS AND SAND RAMMERS

Chicago Pneumatic Tool Co., New York.
Cleveland Pneumatic Tool Co., Cleveland, Ohio.
Ingersoll-Rand Co., New York.

GYPSUM PRODUCTS

U. S. Gypsum Co., Chicago, Ill.

HAMMER DRILLS

(See Drills, Hammer.)

HAMMERS, STEAM, PILE. (See Pile Hammers, Steam)

HEAT INSULATING MATERIAL

*Carey Co., Philip, Cincinnati, Ohio.
Johns-Manville, Inc., New York.

HEATING KETTLES. (See Kettles)

HOISTS, BELT-DRIVEN

*Pawling & Harnischfeger Co., Milwaukee, Wis.
American Hoist & Derrick Co., St. Paul, Minn.
Dobbie Fdry. & Mach. Co., Niagara Falls, N. Y.
Lidgerwood Mfg. Co., New York.
Mead-Morrison Mfg. Co., E. Boston, Mass.
Mundy Hoisting Engine Co., J. S., Newark, N. J.
Street Bros. Mach. Wks., Chattanooga, Tenn.
Weller Mfg. Co., Chicago, Ill.

HOISTS, CONCRETE, TOWER

*Insley Mfg. Co., Indianapolis, Ind.
*Ransome Concrete Mchy. Co., Dunellen, N. J.
Lakewood Engineering Co., Cleveland, O.
Mead-Morrison Mfg. Co., E. Boston, Mass.

HOISTS, ELECTRIC

*Pawling & Harnischfeger Co., Milwaukee, Wis.
American Hoist & Derrick Co., St. Paul, Minn.
Clyde Iron Works Sales Co., Duluth, Minn.
Dobbie Fdry. & Mach. Co., Niagara Falls, N. Y.
Flory Mfg. Co., S., Bangor, Pa.
Lidgerwood Mfg. Co., New York.



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Mundy Hoisting Eng. Co., J. S., Newark, N. J.
National Hoisting Engine Co., Harrison, N. J.
Street Bros. Mach. Wks., Chattanooga, Tenn.
Treadwell Eng. Co., Easton, Pa.

HOISTS, GASOLINE

*American Cement Mchy. Co., Inc., Keokuk, Ia.
*Domestic Engine & Pump Co., Shippensburg, Pa.
*Pawling & Harnischfeger Co., Milwaukee, Wis.
Austin Machinery Corp'n, Toledo, O.
C. H. & E. Manufacturing Co., Milwaukee, Wis.
Buffalo Hoist & Derrick Co., Buffalo, N. Y.
Clyde Iron Works Sales Co., Duluth, Minn.
Construction Machy. Co., Waterloo, Iowa.
Flory Mfg. Co., S., Bangor, Pa.
Lansing Co., Lansing, Mich.
Lidgerwood Mfg. Co., New York.
Mead-Morrison Mfg. Co., E. Boston, Mass.
Monighan Machine Co., Chicago, Ill.
Mundy Hoisting Engine Co., J. S., Newark, N. J.
National Hoisting Engine Co., Harrison, N. J.
Novo Engine Co., Lansing, Mich.
O. K. Clutch & Mach. Co., Columbia, Pa.
Orr & Sembower, Reading, Pa.
Schramm, Inc., West Chester, Pa.
Street Bros. Mach. Wks., Chattanooga, Tenn.

HOISTS, PNEUMATIC

*Denver Rock Drill Mfg. Co., Denver, Colo.
Chicago Pneumatic Tool Co., New York.
Detroit Hoist & Machine Co., Detroit, Mich.
Hanna Eng. Works, Chicago, Ill.
Independent Pneumatic Tool Co., Chicago, Ill.
Ingersoll-Rand Co., New York.
Mead-Morrison Mfg. Co., E. Boston, Mass.
Northern Engineering Works, Detroit, Mich.
Sullivan Mach'y Co., Chicago, Ill.
Worthington Pump & Machy. Corp., New York.

HOISTS, STEAM

*Denver Rock Drill Mfg. Co., Denver, Colo.
*Insley Mfg. Co., Indianapolis, Ind.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Hoist & Derrick Co., St. Paul, Minn.
Austin Machinery Corp'n, Toledo, O.
Byers Machine Co., Ravenna, Ohio.
Clyde Iron Works Sales Co., Duluth, Minn.
Flory Mfg. Co., S., Bangor, Pa.
Hardie-Tynes Mfg. Co., Birmingham, Ala.
Ingersoll-Rand Co., New York.
Lidgerwood Mfg. Co., New York.
Mead-Morrison Mfg. Co., E. Boston, Mass.
Mundy Hoisting Eng. Co., J. S., Newark, N. J.
National Hoisting Engine Co., Harrison, N. J.
Orr & Sembower, Reading, Pa.
Treadwell Eng. Co., Easton, Pa.

HOISTS FOR MOTOR TRUCKS

*Heil Co., The, Milwaukee, Wis.
Rock Mfg. Co., Waterloo, N. Y.
Van Dorn Iron Wks., Cleveland, O.
Wood Hydr. Hoist & Body Co., Detroit, Mich.
(Horizontal Hydr. Hoist Co., Detroit, Mich.)

HOLLOW TILE

Bannon Pipe Co., P., Louisville, Ky.
Dee Co., Wm. E., Chicago, Ill.
Delaware Clay Products Co., Pittsburgh, Pa.
Dickey Clay Mfg. Co., W. S., Kansas City, Mo.
Medal Paving Brick Co., Cleveland, Ohio.
Metropolitan Paving Brick Co., Canton, Ohio.
National Fireproofing Co., Pittsburgh, Pa.

HOPPERS, CONCRETE

*Insley Mfg. Co., Indianapolis, Ind.
*Littleford Bros., Cincinnati, O.
*Ransome Concrete Mchy. Co., Dunellen, N. J.
Lakewood Engineering Co., Cleveland, O.

HOSE, AIR

Chicago Pneumatic Tool Co., New York.
Cincinnati Rubber Mfg. Co., Cincinnati, O.
Goodyear Tire & Rubber Co., Akron, O.
Ingersoll-Rand Co., New York.
Mulconroy Co., Inc., Phila., Pa.
Penna Flexible Metallic Tubing Co., Phila., Pa.
Republic Rubber Co., Youngstown, O.
U. S. Rubber Co., New York.

HOSE, FIRE

Bi-Lateral Fire Hose Co., Chicago, Ill.
Fabric Fire Hose Co., New York.
Goodrich Rubber Co., B. F., Akron, O.
Goodyear Tire & Rubber Co., Akron, Ohio.
U. S. Rubber Co., New York.

HOUSE NUMBERS

Hamilton Metal Prod. Co., Hamilton, O.

HOUSES, PORTABLE. **(See Buildings, Portable)**

HYDRANTS, FIRE

*Ludlow Valve Mfg. Co., Troy, N. Y.
Chapman Valve Mfg. Co., Indian Orchard, Mass.
Columbian Iron Works, Chattanooga, Tenn.
Darling Valve & Mfg. Co., Williamsport, Pa.
Eddy Valve & Mfg. Co., Waterford, N. Y.
Iowa Valve Co., Oskaloosa, Ia.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Norwod Engineering Co., Florence, Mass.
Rensselaer Valve Co., Troy, N. Y.
Smith Mfg. Co., A. P., East Orange, N. J.
Wood & Co., R. D., Philadelphia, Pa.

HYDRAULIC RAMS

Deming Co., Salem, O.
Rice Hydraulic Engine Co., New York.
Seattle Machine Works, Seattle, Wash.

ICE-MAKING MACHINERY

Arctic Ice Mach. Co., Canton, Ohio.
Brunswick-Kroeschell Co., New Brunswick, N. J.
Carbondale Machine Co., Carbondale, Pa.
De La Vergne Machine Co., New York.
Frick Co., Inc., Waynesboro, Pa.
Triumph Ice Machine Co., Cincinnati, O.
United Iron Wks., Kansas City, Mo.
Vilter Mfg. Co., Milwaukee, Wis.
Vogt Mach. Co., Henry, Louisville, Ky.
York Mfg. Co., York, Pa.

INCINERATORS, GARBAGE. **(See Garbage Disposal)**

INDICATOR POSTS. **(See Valves)**

INSPECTING LABORATORIES

*Conard & Busby, Burlington, N. J.
Allentown Testing Laboratories, Allentown, Pa.
Conwell & Co., E. L., Philadelphia, Pa.
Gulick-Henderson Co., New York.
Hunt & Co., Robert W., Chicago, Ill.
N. Y. Testing Laboratories, New York.
Pittsburgh Testing Laboratories, Pittsburgh, Pa.
Standard Testing Laboratories, Inc., New York.

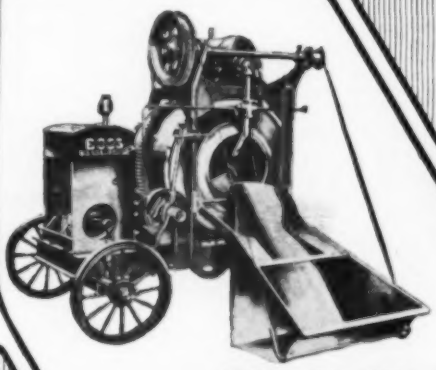
INSTRUMENTS AND SUPPLIES. **(Surveyors' and Engineers')**

Ainsworth & Sons, Wm., Denver, Col.
Beckman Co., L., Toledo, Ohio.
Berger & Sons, C. L., Boston, Mass.
Brandis & Sons Mfg. Co., Brooklyn, N. Y.
Buff & Buff Mfg. Co., Boston, Mass.
Dietzgen Co., Eugene, Chicago, Ill.
Gurley, W. & L. E., Troy, N. Y.
Keuffel & Esser Co., Hoboken, N. J.
Lietz Co., A., San Francisco, Cal.
Leupold & Voelpel, Portland, Ore.
Warren-Knight Co., Phila., Pa.
Weber & Co., F., Philadelphia, Pa.
White Co., David, Milwaukee, Wis.
Wissler Instrument Co., St. Louis, Mo.

IRON WORK, STRUCTURAL AND ORNAMENTAL **(See Bridges and Buildings)**

JACKS, LIFTING

*McKiernan-Terry Drill Co., New York.
Bud Company, Chicago, Ill.
Duff Mfg. Co., Pittsburgh, Pa.
Joyce-Gridland Co., Dayton, O.
Norton, Inc., A. O., Boston, Mass.
Rees Mfg. Co., Pittsburgh, Pa.
Templeton, Kenly & Co., Ltd., Chicago, Ill.
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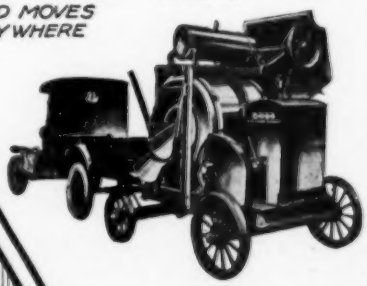
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JACKS, PIPE FORCING

*Clark Co., H. W., Mattoon, Ill.
Duff Mfg. Co., Pittsburgh, Pa.

JAIL AND PRISON WORK

Barnum Iron Works, E. T., Detroit, Mich.
Pauly Jail Bldg. Co., St. Louis, Mo.
Stewart Iron Works Co., Cincinnati, Ohio.
Van Dorn Iron Works Co., Cleveland, O.

JOINTS, EXPANSION PAVING
(See Expansion Joint Material)

JOINTS, FLEXIBLE PIPE. (See Flexible Joints.)

KETTLES, FOR ASPHALT AND TAR HEATING

*Barber Asphalt Co., Philadelphia, Pa.
*Connery & Co., Inc., Philadelphia, Pa.
*Good Roads Machinery Co., Kennett Square, Pa.
*Kinney Mfg. Co., Boston, Mass.
*Littleford Bros., Cincinnati, O.
*Universal Road Machinery Co., Kingston, N. Y.
Acme Road Mach. Co., Frankfort, N. Y.
Hauck Mfg. Co., Brooklyn, N. Y.
Honhorst Co., Jos., Cincinnati, Ohio.
Macleod Co., Cincinnati, Ohio.
Stuebner Iron Wks., G. L., L. I. City, N. Y.
Tarrant Mfg. Co., Saratoga Springs, N. Y.
Union Iron Wks., Hoboken, N. J.

LANTERNS, CONTRACTORS'

Adams & Westlake Co., Chicago, Ill.
Defiance Lantern & Stamping Co., Rochester, N.Y.
Dietz Co., R. E., New York.
Handlan, Buck Mfg. Co., St. Louis, Mo.
Star Headlight & Lantern Co., Rochester, N. Y.

LATH, METAL

*Truscon Steel Co., Youngstown, O.
Berger Mfg. Co., Canton, O.
Bostwick Steel Lath Co., Niles, O.
General Fireproofing Co., Youngstown, O.
Milwaukee Corrugating Co., Milwaukee, Wis.
Northwestern Expanded Metal Co., Chicago, Ill.
Penn. Metal Co., Boston, Mass.
Sykes Metal Lath & Roofing Co., Niles, O.
Youngstown Pressed Steel Co., Warren, O.

LAWN MOWERS

Chadborn & Coldwell Mfg. Co., Newburgh, N. Y.
Coldwell Lawn Mower Co., Newburgh, N. Y.
Gilson Mfg. Co., Port Washington, Wis.
Ideal Power Lawn Mower Co., Lansing, Mich.
Jacobsen Mfg. Co., Racine, Wis.
Penna. Lawn Mower Works, Philadelphia, Pa.
Philadelphia Lawn Mower Co., Philadelphia, Pa.
Townsend Co., S. P., Bloomfield, N. J.
Western Implement Co., Port Washington, Wis.
Worthington Mower Co., Stroudsburg, Pa.

LEADITE

Leadite Co., The, Philadelphia, Pa.

LEAD-MELTING FURNACES

*Littleford Bros., Cincinnati, O.
Canton Fdry. & Machy. Co., Canton, O.
Chicago Flexible Shaft Co., Chicago, Ill.
Focht's Sons, Geo., Hoboken, N. J.
Hauck Mfg. Co., Brooklyn, N. Y.
Smith Mfg. Co., A. P., E. Orange, N. J.

LETTERS AND FIGURES, METAL

Niagara Metal Stamp Corp., Niagara Falls, N. Y.

LIGHTS, CONTRACTORS

Carbic Mfg. Co., Duluth, Minn.
General Electric Co., Schenectady, N. Y.
Hauck Mfg. Co., Brooklyn, N. Y.
Macleod Co., Cincinnati, O.
Milburn Co., Alex., Baltimore, Md.
Prest-O-Lite Co., Inc., New York.

LIGHTING STANDARDS. (See Street Lamp Posts)

LIQUID CHLORINE

Arnold, Hoffman & Co., Inc., New York.
Electro Bleaching Gas Co., New York.
Hooker Electrochemical Co., New York.
Mathieson Alkali Works, Inc., New York.
Penna. Salt Mfg. Co., Philadelphia, Pa.

LOADERS, GRAVEL, WAGON, CAR, ETC.

*Atlas Engineering Co., Milwaukee, Wis.
*Bay City Dredge Works, Bay City, Mich.
*Green, L. P. Chicago, Ill.
*Haiss Mfg. Co., Geo., New York.
*Sauerman Bros., Chicago, Ill.
*Universal Road Machinery Co., Kingston, N. Y.
Austin Machinery Corp'n, Toledo, O.
Bacon Co., Edw. R., San Francisco, Cal.
Barber-Greene Co., Aurora, Ill.
Bonney Supply Co., Inc., Rochester, N. Y.
Chain Belt Co., Milwaukee, Wis.
Conant Machine Co., Concord Junction, Mass.
Economy Excavator Co., Iowa Falls, Iowa.
Fairfield Engineering Co., Lancaster, Ohio.
Gifford-Wood Co., Hudson, N. Y.
Jeffrey Mfg. Co., Columbus, O.
Lee Trailer & Body Co., Chicago, Ill.
Link-Belt Co., Chicago, Ill.
Lyle Culv. & Rd. Equip. Co., Minneapolis, Minn.
Nelson Iron Wks., Brooklyn, N. Y.
Portable Machy. Co, Passaic, N. J.
Sackett Screen & Chute Co., H. B., Chicago, Ill.
Smith Co., T. L., Milwaukee, Wis.
Weller Mfg. Co., Chicago, Ill.

LOCK BAR STEEL PIPE

East Jersey Pipe Co., New York.

LOCKERS, STEEL

Durand Steel Locker Co., Chicago, Ill.
Hart & Hutchinson Co., New Britain, Conn.
Lyon Metallic Mfg. Co., Aurora, Ill.
Medart Mfg. Co., Fred., St. Louis, Mo.

LOCOMOTIVES, FOR CONTRACTORS, ETC.

American Locomotive Co., New York.
Baldwin Locomotive Works, The, Phila., Pa.
Brookville Track & Tractor Co., Brookville, Pa.
Davenport Locomotive Works, Davenport, Ia.
Fate-Root-Heath Co., Plymouth, O.
Lima Locomotive Wks., Lima, O.
Industrial Equipment Co., Inc., Minster, O.
Milwaukee Locomotive Mfg. Co., Milwaukee, Wis.
Porter Co., H. K., Pittsburgh, Pa.
Vulcan Iron Works, Wilkes-Barre, Pa.
Westinghouse Elec. & Mfg. Co., E. Pittsb'gh, Pa.
Whitcomb Co., Geo. D., Rochelle, Ill.

LUMBER, HEAVY CONSTRUCTION

Brown Co., Portland, Me.
Crowell & Spencer Lumber Co., Long Leaf, La.
Exchange Sawmills Sales Co., Kansas City, Mo.
Great Southern Lumber Co., Bogalusa, La.
Industrial Lumber Co., Elizabeth, La.
Long Bell Lumber Co., Kansas City, Mo.
Sargent Lumber Co., Little Rock, Ark.
Sterner Co., Inc., E. J., New York.
Weyerhaeuser Sales Co., Spokane, Wash.

LUMBER, STEEL

*Truscon Steel Co., Detroit, Mich.
Berger Mfg. Co., Canton, O.
General Fireproofing Co., Youngstown, O.
National Pressed Steel Co., Massillon, O.

MANHOLE COVERS. (See "Castings, Street")

METAL LATH. (See "Lath")

METAL ROOFING (See "Roofing")

METER BOXES

*Clark Co., H. W., Mattoon, Ill.
*Ford Meter Box Co., Wabash, Ind.
Clow & Sons, J. B., Chicago, Ill.
Columbian Iron Works, Chattanooga, Tenn.
Mueller Company, Decatur, Ill.

METER COUPLINGS

*Clark Co., H. W., Mattoon, Ill.
*Ford Meter Box Co., Wabash, Ind.
*Neptune Meter Co., New York.
*Pittsburgh Meter Co., Pittsburgh, Pa.
*Union Water Meter Co., Worcester, Mass.
Mueller Company, Decatur, Ill.

METER TESTERS

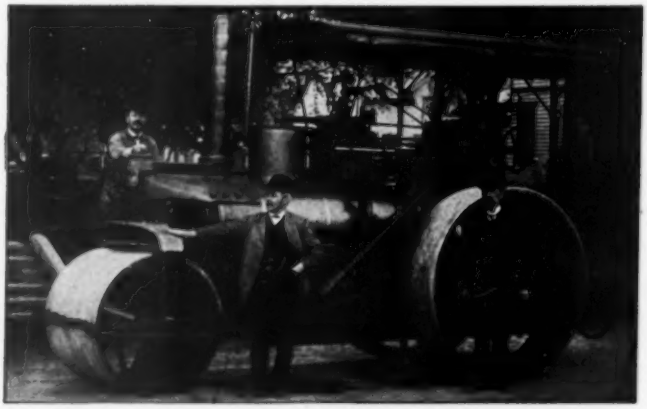
*Clark Co., H. W., Mattoon, Ill.

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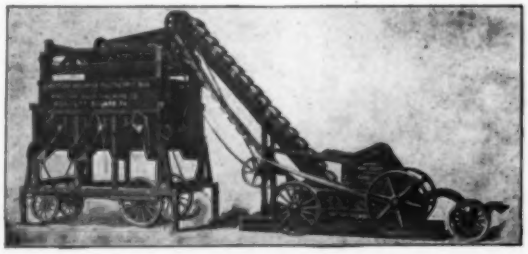
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*Neptune Meter Co., New York.
*Pittsburgh Meter Co., Pittsburgh, Pa.
Buffalo Meter Co., Buffalo, N. Y.
Mueller Co., Decatur, Ill.
National Meter Co., New York.

METERS, ELECTRIC (WATTHOUR)

Duncan Elec. Mfg. Co., LaFayette, Ind.
General Electric Co., Schenectady, N. Y.
Sangamo Electric Co., Springfield, Ill.
Westinghouse El. & Mfg. Co., E. Pittsburgh, Pa.

METERS, GAS

*Pittsburgh Meter Co., Pittsburgh, Pa.
American Meter Co., New York.
Bailey Meter Co., Cleveland, O.
Builders Iron Fdry., Providence, R. I.
Cleveland Gas Meter Co., Cleveland, O.

METERS, Water

*Badger Meter Mfg. Co., Milwaukee, Wis.
*Neptune Meter Co., New York.
*Pittsburgh Meter Co., Pittsburgh, Pa.
*Union Water Meter Co., Worcester, Mass.
Buffalo Meter Co., Buffalo, N. Y.
Federal Meter Co., Brooklyn, N. Y.
Gamon Meter Co., Newark, N. J.
Hersey Mfg. Co., Boston, Mass.
National Meter Co., New York.
Thomson Meter Co., Brooklyn, N. Y.
Worthington Pump & Mchy. Corp., New York.

METERS, WATER (VENTURI TYPE)

Builders Iron Foundry, Providence, R. I.
Simplex Valve & Meter Co., Philadelphia, Pa.

MIXERS, CONCRETE (See Concrete Mixers)

MIXERS, GROUT

*American Cement Mchy. Co., Inc., Keokuk, Ia.
Kent Machine Co., Kent, O.
Lakewood Engineering Co., Cleveland, O.
Union Iron Works, Inc., Hoboken, N. J.

MIXERS, HOT

*Barber Asphalt Co., Philadelphia, Pa.
*Koehring Co., Milwaukee, Wis.
Austin Machinery Corp'n, Toledo, O.

MIXERS, MORTAR

*American Cement Mchy. Co., Inc., Keokuk, Ia.
*Blaw-Knox Co., Pittsburgh, Pa.
*Ransome Concrete Mchy. Co., Dunellen, N. J.
Austin Machinery Corp'n, Toledo, O.
C. H. & E. Manufacturing Co., Milwaukee, Wis.
Construction Machinery Co., Waterloo, Ia.
Kent Machine Co., Kent, O.
Knickerbocker Co., Jackson, Mich.
Lansing Co., Lansing, Mich.
Lakewood Engineering Co., Cleveland, Ohio.
Marsh-Capron Co., Chicago, Ill.
Smith Co., T. L., Milwaukee, Wis.

MOTORCYCLES

Ace Motor Corp., Philadelphia, Pa.
Cleveland Motorcycle Co., Cleveland, Ohio.
Excelsior Motor Mfg. & Supply Co., Chicago, Ill.
Harley-Davidson Motor Co., Milwaukee, Wis.
Indian Motocycle Co., Springfield, Mass.

MOTORS, ELECTRIC (See Electric Generators and Motors)

MOTORS, GASOLINE

Buda Co., Harvey, Ill.
Continental Motors Corp., Detroit, Mich.
Herschell-Spillman Co., No. Tonawanda, N. Y.
Hinkley Motors, Inc., Detroit, Mich.
Waukesha Motor Co., Waukesha, Wis.
Wisconsin Motor Mfg. Co., Milwaukee, Wis.

MOTOR TRUCKS

*Ford Motor Co., Detroit, Mich.
*Garford Motor Truck Co., Lima, O.
*General Motors Truck Co., Pontiac, Mich.
*International Motor Co., New York.
Acme Motor Truck Co., Cadillac, Mich.
Atterbury Motor Car Co., Buffalo, N. Y.
Autocar Co., Ardmore, Pa.
Bessemer Motor Truck Co., Grove City, Pa.
Brockway Motor Truck Co., Cortland, N. Y.
Clydesdale Motor Truck Co., Clyde, O.
Denby Motor Truck Co., Detroit, Mich.
Diamond T. Motor Car Co., Chicago, Ill.
Duplex Truck Co., Lansing, Mich.
Federal Motor Truck Co., Detroit, Mich.
Four Wheel Drive Auto Co., Clintonville, Wis.
Gramm Bernstein Truck Corp'n, Lima, O.
The Hug Co., Highland, Ill.
Indiana Truck Corp'n., Marion, Ind.
International Harvester Co., Chicago, Ill.
Kelly Springfield Motor Truck Co., Springfield, O.
Kissel Motor Car Co., Hartford, Wis.
Larrabee-Deyo Motor Tr. Co., Binghamton, N. Y.
Nash Motors Co., Kenosha, Wis.
Pierce-Arrow Motor Car Co., Buffalo, N. Y.
Republic Motor Truck Co., Alma, Mich.
Service Motor Truck Co., Wabash, Ind.
Sterling Motor Truck Co., Milwaukee, Wis.
Stewart Motor Corp'n, Buffalo, N. Y.
Traffic Motor Truck Co., St. Louis, Mo.
Transport Truck Co., Mt. Pleasant, Mich.
U. S. Motor Truck Co., Cincinnati, O.
White Co., Cleveland, Ohio.

MOULDS, CONCRETE

*Blaw Knox Co., Pittsburgh, Pa.

NUMBERS, HOUSE (See "House Numbers")

OAKUM

Wall Rope Works, Beverly, N. J.

OILS, ROAD

*Barber Asphalt Co., Philadelphia, Pa.
*Barrett Co., New York.
*Standard Oil Co., (Indiana), Chicago, Ill.
*Texas Company, New York.
Atlantic Refining & Asphalt Corp'n, Philadelphia
Headley Good Roads Co., Philadelphia, Pa.
Pierce Oil Corp., New York.
Pioneer Asphalt Co., Lawrenceville, Ill.
Sinclair Refining Co., Chicago, Ill.
Standard Oil Co., (La.) New Orleans, La.
Standard Oil Co., (N. J.), Newark, N. J.
Standard Oil Co. (N. Y.), New York.
U. S. Asphalt Refining Co., New York.

OXY-ACETYLENE APPARATUS

Oxweld Acetylene Co., Newark, N. J.

OXYGEN

Linde Air Products Co., New York.

PACKING, WATER PIPE

*Union Water Meter Co., Worcester, Mass.
Leadite Co., The, Philadelphia, Pa.
United Lead Company, New York.

PAINT GUNS

Spray Painting & Finishing Equipment Sales Co., Boston, Mass.

PAINTS, METAL PROTECTION

*Barber Asphalt Co., Philadelphia, Pa.
*Barrett Co., New York.
*Carey Co., Philip, Cincinnati, Ohio.
*Dixon Crucible Co., Jos., Jersey City, N. J.
*Solvay Process Co., Syracuse, N. Y.
Acme White Ld. & Col. Works, Detroit, Mich.
Berry Bros., Detroit, Mich.
Cook Paint & Varnish Co., Kansas City, Mo.
Detroit Graphite Co., Detroit, Mich.
Detroit White Lead Wks., Detroit, Mich.
Du Pont de Nemours & Co., Inc., E. I., Wilmington, Del.
Minwax Co., New York.
Protexol Corpn., New York.
Ruberoid Co., New York.
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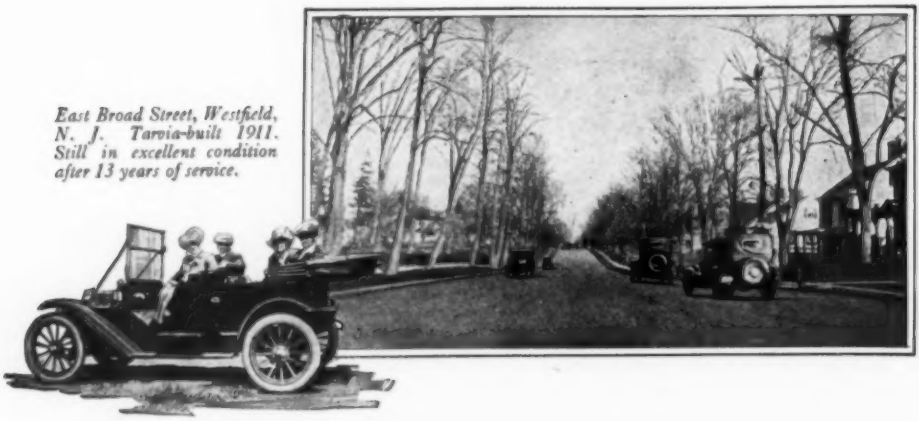
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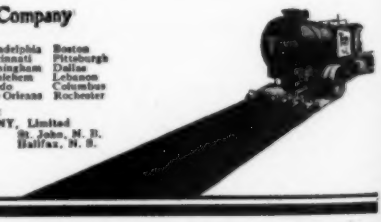
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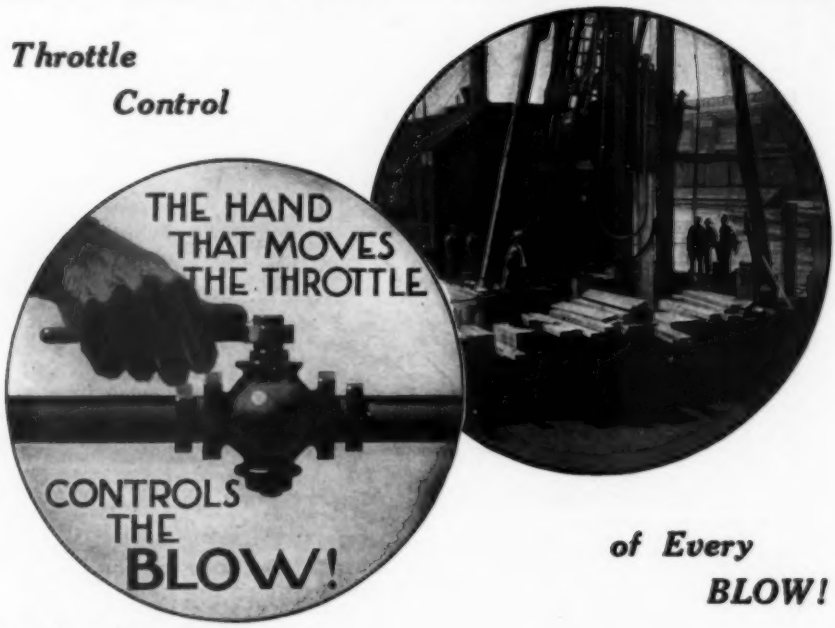
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*Littleford Bros., Cincinnati, O.
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White Co., Cleveland, O.

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*Acme Road Mach. Co., Frankfort, N. Y.
*Adams & Co., J. D., Indianapolis, Ind.
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*Baker Mfg. Co., Springfield, Ill.
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Indiana Shovel Co., New Castle, Ind.
Jackson Shovel Co., Montpelier, Ind.
Pittsburgh Shovel Co., Pittsburgh, Pa.
Russell Shovel Co., Aliquippa, Pa.
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Bellwood Steam Shovel Co., Bellwood, Pa.
Browning Co., Cleveland, O.
Bucyrus Co., South Milwaukee, Wis.
Byers Machine Co., J. F., Ravenna, Ohio.
Erie Steam Shovel Co., Erie, Pa.
Fairbanks Steam Shovel Co., Marion, O.
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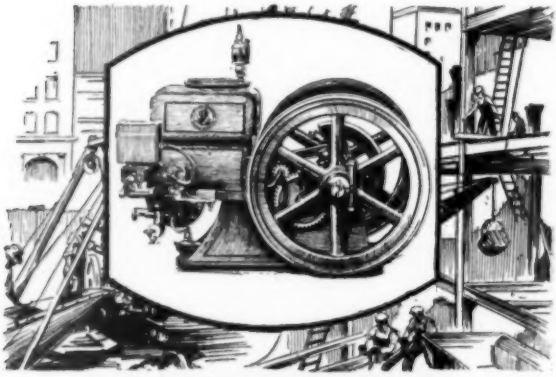
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Rensselaer Valve Co., Troy, N. Y.
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SMOKE STACKS. (See Stacks, Steel)

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Graver Corporation, E. Chicago, Ind.
Heltzel Steel Form & Iron Co., Warren, O.
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Scaife & Sons, Wm. B., Pittsburgh, Pa.
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Union Iron Works, Hoboken, N. J.
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Walsh & Weidner Boiler Co., Chattanooga, Tenn.

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Etnyre & Co., E. D., Oregon, Ill.
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Tiffin Wagon Co., Tiffin, O.
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Mott Iron Wks., J. L., New York.
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STREET SIGNS **(See Signs, Street)**

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Ind. Brush & Broom Mfg. Co., Indianapolis, Ind.
Kendallville Broom & Brush Co., Kendallville, Ind.
Lang Broom Co., Pittsburgh, Pa.
Lay Co., Jos., Ridgeville, Ind.
Milwaukee Brush Mfg. Co., Milwaukee, Wis.
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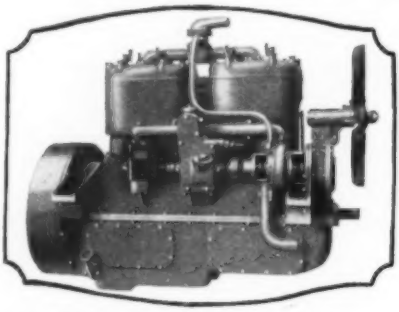
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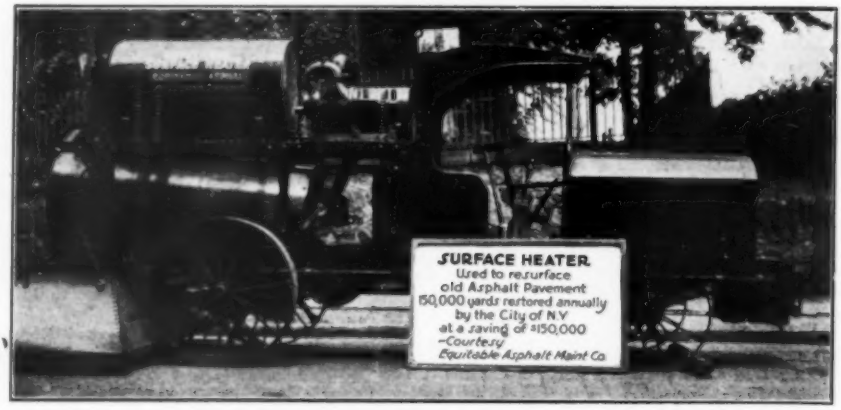
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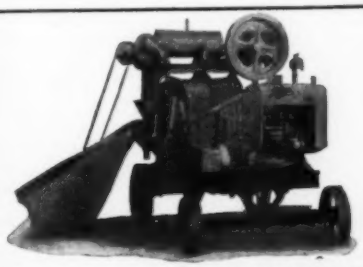
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Construction Features of the Spring Street Viaduct, Atlanta

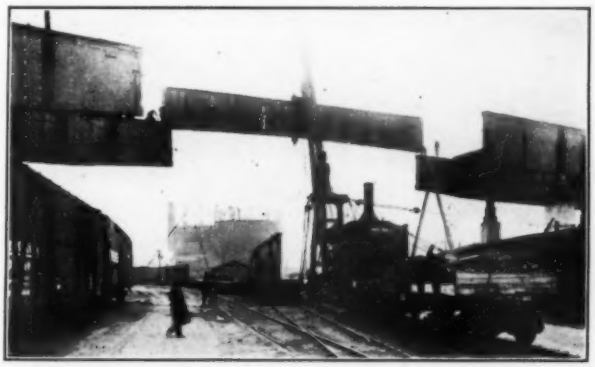
Plate Girder Structure Coated with Gunite Has Eliminated Grade Crossings and Expedited Vehicular Traffic

By J. H. Reed

ON December, 1923, the new Spring Street Viaduct in Atlanta, Ga., was opened to the public. It is a beautiful concrete and steel structure, 1,900 feet long by 60 feet wide, and crosses six railroad tracks at an average height of more than 20 feet. Back of this mere statement is a story of far-sighted planning, hard work and engineering skill. In 1920 Mayor James L. Key took the first step in securing the viaduct by having improvements made in Spring Street. The street was regraded, masonry retaining walls were constructed and the roadway widened to 40 feet, or 60 feet between building lines. Many buildings were moved back and many others cut into to secure this width, and finally a concrete pavement was laid straight through the downtown district of Atlanta on Spring Street.

The county spent about $500,000 on the Spring Street improvements in 1920 and 1921, as this street offered the only direct route from Brookwood Station to the heart of the city and was the only street on which there was no considerable amount of street-car track. Further, it cut a full half-mile off the distance from Brookwood Station to the City Hall and was destined to be the main automobile thoroughfare in the city.

In 1921 the City Council decided to float a bond issue of about $8,000,000 with which to build new schools, improve the water-works and lay new sewers. In this $750,000 was included for the construction of the Spring Street Viaduct to connect Spring Street with Madison Avenue across Atlanta's railroad gorge. A Viaduct Committee composed of W. A. Cooper, a prominent Atlanta business man, as Chairman, Major R. J. Guinn, Vice-Chairman, and W. C. Carraway, George A. Gershon, and Lee Ashcraft as the other members of the Committee, was elected to superintend the work of construction. It was necessary to secure permission to cross the railroad tracks, select an architect and let the contract. Considerable difficulty was encountered in getting permission to cross land owned by the state of Georgia and by the Central of Georgia Railroad. Consent was finally secured after the Committee agreed to build an 8-story cement warehouse for a company whose building had to be cut, build another approach to the freight yards and do all of the work of altering the Seaboard freight



RAILROAD CRANE SETTING GIRDER IN THE SPRING STREET VIADUCT, ATLANTA, GA.

depot, over which the new aqueduct would pass. To design a viaduct and take charge of construction, it was decided to secure both a local company and an outside firm, so Robert and Company of Atlanta, and Harrington, Howard and Ash of Kansas City, Mo., were selected, and they agreed upon W. E. Reynolds as engineer in charge of the construction.

Plans were drawn up and a contract let to the Nichols Construction Company, Atlanta, Ga., for the general work of construction and to the Virginia Bridge and Iron Company, Roanoke, Va., for the iron and steel work. In September, 1922, construction was actually started.

Foundation Troubles

The foundation plans called for concrete columns extending down to bed-rock, which in some instances was at a depth of more than 30 feet. About the middle of the viaduct, it was discovered that the railroad lines lay on a fill from 20 to 35 feet in depth. At that point Raymond concrete piles about 34 feet long and tapering with a diameter of 8 inches at the bottom and 22 inches at the top were used. These piles of 1:2:4 concrete were driven in the column locations, from 12 to 24 being used under each column, according to the load it was designed to carry, and each pile driven 3 feet on centers both ways. On top of each set of piles a concrete footing 12 feet wide by 18 feet long and about 3½ feet thick was laid. The first layer of the footing was placed so as to cover about 3 inches of the top of the piles, thus making it impossible for them to spread. On this a steel mat was laid with a few inches of concrete between the piles and the steel, to give proper bearing. On top of the footings reinforced concrete columns were built to carry the girders of the bridge. The columns are of 1:3:5: concrete with ordinary reinforcement and measure 4 by 6 feet, ranging from 20 to 30 feet in height. Specially designed steel caps were bolted to the top of the columns to carry either rollers or rockers to provide for the expansion and contraction of the girders.

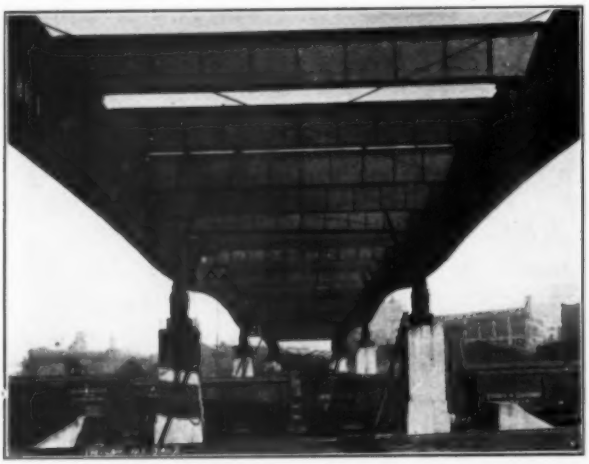
The foundations for the Madison Avenue end of the viaduct, which were below the level of ground water, were composed of creosoted wood piles on which the superstructure was built.

Girder Construction

The approaches on either side of the viaduct are of plain concrete construction, but about 1,000 feet of the viaduct proper is of steel girder construction. The steel construction was necessary because a concrete viaduct would require too many columns. There are 39 tracks running under the viaduct, which could not very well be moved to place the additional columns. The longest span is 490 feet.

The two girders comprising this span are said to be the longest in the world in use on a viaduct. The two largest single girders were 135 feet long and weighed 60 tons apiece and were brought to Atlanta each mounted on three freight cars, which had to be especially routed to avoid sharp turns and bridges not capable of standing up under their weight. Some of the structural steel used was sent twice the ordinary distance to Atlanta, to insure safe transportation. Harrington, Howard and Ash designed special rocker bearings for the girders, which when riveted together make spans of 490 feet and which expand a full inch at each end.

At the two central columns which form the apex of the viaduct arch the two girders are securely fastened. At the second two and last two columns, however, special roller bearings are used to permit expansion. Three rollers are tied together to form a rocker under the girder. If the bearings were perfectly round, each would be about 20 inches high and about 22 inches in diameter. As only a small part of their surface is needed to provide for the movement caused by expansion and contraction, however, the two sides of the circle are cut away, leaving the bearing 22 inches high, 22 inches wide, and 8 inches across. This makes it possible to put the three rollers into much less space and simplifies construction. A space of about one inch is left between the rollers when the bearing is tied together. The viaduct has four of these rocker sets to provide for expansion



VIEW OF THE STEEL WORK ON SPRING STREET VIADUCT, ATLANTA, PRIOR TO APPLYING GUNITE TO PROTECT IT FROM THE GASES FROM LOCOMOTIVES



AN AEROPLANE VIEW SHOWING THE LOCATION OF THE SPRING STREET VIADUCT RECENTLY COMPLETED IN ATLANTA, GA.

and contraction, in addition to a number of similar roller bearings under the smaller girders.

The girders were hoisted into place by the contractors by means of two special railroad derricks loaned by the railroad as their part of the work.

Floor Construction

In the floor construction cross-beams are laid every 6½ to 8 feet, according to the curves in the viaduct between the girders. Between these cross-girders is laid a reinforced concrete floor 8 inches thick. The reinforcement consists of steel rods laid across the cross-beams, the concrete being of 1:2:4 mixture. Above this concrete floor is a 2-inch asphalt pavement.

The sidewalk on the viaduct is laid outside of the girder, and the roadway inside so that the girder corresponds to the curbstone in ordinary road construction. The sidewalk is of concrete and is protected by a concrete railing.

Protection of Girders

In order to protect the steel girders from the gases from the locomotives, first, ½-inch holes 18 to 24 inches in centers were punched through the girders and then a special wire mesh made by the National Steel Fabric Company, Pittsburgh, Pa., was wired on through these holes. This electrically welded 1½-inch mesh was tied over every bit of metal work on the viaduct and then the girders were completely coated with Gunite from three cement guns, made by the Cement Gun Company, Allentown, Pa., using a 1:3 mixture. This not only will preserve the girders from corrosion, but beautifies the structure.

Other Improvements

While the viaduct itself is complete and in use, the Hunter Street approach is still under construction. This approach is an entire city block long and 84 feet wide. There is an underpass 30 feet wide, running down to the freight depot. The approaches on either side are 26 feet wide, giving ample room far traffic.

On Marietta Street a 10-foot alley is being widened to 30 feet, by cutting away the end of a 4-story building. This extension will be made clear across the railroad tracks and up on the other side of the gorge.

On Forsyth Street a narrow underpass will be closed and two others will be combined, making an approach 10 feet wide, which will be of great help to traffic.

Beware the man who discusses the ethics of work. The real worker is busy at his job, and is not orating.—*Bradley Hummer.*

Book Reviews

CONTRACTORS' ACCOUNTING PRACTICE

By William M. Affelder, Comptroller, Thompson-Starrett Company, and Special Lecturer in Construction Accounting, College of the City of New York. The Ronald Press, New York. 1924. 386 pp. Illustrated. $5.

This book, the result of 20 years' service in the construction industry, covers the entire field of construction accounting practice. It embraces the several forms of contract in use and follows through all phases of construction work from the inception of operation to the completion of the job. It takes up the question of initial field records and their value to a proper cost system, types of which are developed, and the auditing of construction accounts. The book is well illustrated with many types of forms for accounting work, and the appendices cover standard forms of contracts, agreements, equipment experience tables, rental agreements and surety bonds.

The book has been developed in a particularly helpful manner, being divided into four parts, the first discussing conditions underlying the accounting system, taking up field problems, financial problems, office and field organization, relations of the owner and the contractor, preliminary negotiations, types of contract, payments, the contractor and his field forces, checking workmen's time, pay-roll problems and time keeping, the contractor and the material dealer (covering purchase agreements, purchase orders and records), the contractor and the subcontractor, insurance and bonds, and the contractors' equipment. Part 2 deals with general accounting for the contractor's office (covering procedure, pay-roll, deliveries of material, return of material and material carried in stock, equipment, rental charges, repairs, petty cash disbursements), the accounting system (covering methods of checking transportation charges, deliveries, watching material in transit, the various types of ledgers, cash books and journals, and notes receivable), the purchase register, contract ledgers, account groups and journal entries, the general ledger, financial statements and the statement of uncompleted contracts, profit and loss statements, the balance sheet, miscellaneous statements, the contractor's accounting to owners under the cost plus contract, and auditing construction accounts. Part 3: Cost accounting for the contractor's office, covering the cost accounting system and methods of analyzing costs and cost reports. Part 4: Accounting systems for owners and architects.

THE MOTOR TRUCK—APPLIED MECHANICS FOR THE OWNER AND DRIVER

By Edward E. La Schum, General Superintendent, Motor Vehicle Equipment, American Railway Express; and Harold E. Bardwell. U. P. C. Book Company, Inc., New York. 1924. First edition. 325 pp. Illustrated. Price $4.00.

This book, dedicated to all who strive to advance the science of transportation by the correct application of motor vehicle equipment, is written especially for truck operators, showing both sides of all discussions, and should prove particularly helpful to those who have recently taken up the use of motor trucks. This text will assist in preventing them from stumbling into the pitfalls which beset the truck operator and from which only extensive experience can rescue him. For the experienced operator, it will serve as a checking-up of his theories and also give him additional miscellaneous information which will save him time, trouble and expense in future operations. The separate chapters of the book discuss the power-plant, carburetors, electrical equipment, radiators, lubrication, fuel and heat, the chassis, the running gear, performance, and records of performance and maintenance, including simple forms for cost accounting.

Explosives Set World's Records in Shandaken Tunnel

THE boring of the Shandaken Tunnel under the Catskill Mountains as a part of the system to increase New York City's water-supply, resulted, it has now been determined, in some of the speediest tunnel driving with modern explosives of which there is any record. In one calendar month, operating on a two-shift basis, according to figures of the New York City Board of Water Supply, 620 feet were excavated on the south heading of Shaft 1 towards the intake near Prattsville. This is believed to constitute a world's record for two-shift work. During another calendar month 596 feet were excavated with the aid of dynamite near Allaben on the south end of Shaft No. 7. The greatest advance with one round of shots was 14 feet, 5 inches. In one year the builders, with the use of powerful explosives, were able to put through nearly 9 miles of tunnel excavation. The rock encountered varied from shale through sandstone to true quartzite, the last of which makes especially hard drilling.

There were 584,000 cubic yards of rock excavated, and the total length of holes drilled was 3,000,000 feet, or 570 miles. About 2,500,000 pounds of dynamite was used.

The tunnel is 18.2 miles in length and the longest in the world. It connects the Schoharie Reservoir with the Ashokan Reservoir, and is a part of the new system which has just been put into use, which will make certain an adequate water-supply for New York City. The explosive used was a powerful gelatin dynamite, which, with modern engineering practice, made this gigantic work possible.

New Chausse Agencies

THE Chausse Oil Burner Company, Goshen, Ind., has announced the appointment of the following sales agencies which will handle the sale of Chausse Oil Burner tool and surface heaters and contractor's apparatus and salamanders in their respective territories: Baksted Machinery Company, Peoples Gas Building, Chicago, Ill.; W. B. Spencer, 30 Church Street, New York, N. Y.; The Clark-Wilcox Company, 902 Chapel Street, New Haven, Conn.; Willamette Equipment Company, Portland, Ore.; Willamette Equipment Company, Tacoma, Wash.; Minneapolis Equipment Company, Minneapolis, Minn., and W. F. Cleary Sales Agency, Indianapolis, Ind.

Road Machinery Company Moves Boston Office

THE Good Roads Machinery Company, Inc., Kennett Square, Pa., has announced the removal of its Boston office from 61 Oliver Street to 36 Pleasant Street, Watertown, Mass. At the new location it has opened an office and a large warehouse, which will operate for the better service of the New England trade.

LEGAL POINTS FOR CONTRACTORS

These brief abstracts of court decisions in the contracting fields may aid you in avoiding legal difficulties. Local ordinances or state laws may alter the conditions in your community. If in doubt, consult your own lawyer

Edited by A. L. H. Street, Attorney-at-Law

Elements of "Workmanship"—Damages Recoverable by Owner

A building contract requiring first-class "workmanship" protects the owner against use of bad or unsuitable material. The measure of damages recoverable from a contractor on account of defective granolithic flooring is the reasonable cost of putting the floor in the condition required by the contract. (Virginia Supreme Court of Appeals, Lamberg vs. Jenkins, 71 Southeastern Reporter, 718.)

Scope of Provision Requiring Written Order for Extras

Provision in a building contract that no extra charges shall be made by the builder unless there shall be a written order fixing the price applies to alterations in the plan of doing the work as well as to additions in and about the building. (Montana Supreme Court, Piper vs. Murray, 115 Pacific Reporter, 669.)

Extension of Credit as Waiver of Mechanic's Lien

A mechanic's lien is not waived by extending credit, unless the time of payment is extended beyond that within which suit may be brought to enforce the lien. (New York Supreme Court, Appellate Division, Second Department; Landsberg & Company v. Hein Construction Company; 120 New York Supplement, 190.)

Haulers of Materials as Employees and as Independent Contractors

In a case before the Industrial Commission of Wisconsin—Harris vs. Youell & Lock—claimant's right to an award under the Workmen's Compensation Act of that state depended on whether he was an independent contractor or an employee of the respondent. It appeared that the injury against which he complained was sustained in the course of hauling gravel for respondent. It was conceded that if claimant was an independent contractor he was not entitled to an award. In disposing of the matter the Commission said:

"It has been generally held that where control is exercised over goods hauled, such control being exercised over the person rendering the service, such person is a servant rather than an independent contractor. The question arises in this case as to what control was exercised by the respondent and as to whether the right to control the material being conveyed existed on their part. We think there is no question in this case but that the respondent had the complete right to exercise full control over the movements of the applicant, over the manner in which he hauled gravel, over the place from which it was procured, and, generally, as to the details of the work being performed. It is true that, due to the character of the work, such control may not at all times have been apparent. This is due to the fact that the work was not of such a nature as to require constant supervision and direction by the respondent; and also due to the fact that the applicant was experienced in the sort of work being performed. We believe the fact remains, however, and that the fair inference must be drawn from the testimony, that the applicant was under the orders of the respondent at all times in respect to the means and methods used to attain the end for which he was employed. In such circumstances the relation between employer and employee exists, and compensation must be awarded."

Building Contract Construed

A supervising architect received letters from holders of patents for flooring, offering to construct floors according to certain specifications and guarantee that they would carry a specified weight. The offers were rejected and the architect requested contractors to make an offer, which they did without referring to the letters, and it was accepted. The architect authorized the builders to proceed as per the estimate, "said sum to cover the five floors in accordance with the accompanying letters" of the patent holders. The builders contracted with the patent holders to put in their flooring to the "satisfaction, approval, and acceptance" of the architect. *Held*, that the contract between the owner and the builders did not include a guaranty that the floors would carry the weight contained in the offer of guaranty of the patent holders, and the builders could not be held liable for a subsequent settling of the floors, due to a lesser weight; the floors having been constructed according to the plans, and the architect's approval having been given after a test made in his presence. Under a provision in a building contract that the owner might make alterations, subject to the architect's approval, without affecting the contract, that the architect should issue a final certificate as to the balance due, which should be conclusive evidence of the performance of the contract, and that his decision should be final and binding on all parties, his final certificate is a conclusive determination that the contractors properly performed their duties according to their contract. (Pennsylvania Supreme Court, Wiggins vs. Columbian Fireproofing Company, 76 Atlantic Reporter, 742.)

Validity of Contract for Increased Compensation

There is a general rule that a bare promise to pay a contractor or other person a larger price than that for which he has already bound himself to do certain work, or sell certain property, is not enforceable because lacking legal consideration. But there are important qualifications of the rule, and one of them was indicated in the case of Whitehouse vs. Green, 81 Pennsylvania Superior Court Reports, 386.

Plaintiff was a brick subcontractor under contract with one, Bernstein, to do certain brick work on premises owned by defendant, Green. During the progress of the work, the bricklayers struck. Before the strike was settled, defendant proposed to plaintiff to pay him $350 in addition to what he was to receive from the general contractor, Bernstein, under the subcontract if plaintiff would pay the bricklayers emp'oyed by him the increased rate of wages demanded by them (and for which they struck) and have them start work immediately. Plaintiff accepted the proposal and performed, but defendant refused to pay.

Affirming judgment in favor of plaintiff, the Superior Court said:

"The verdict determines that the contract was made and performed. The County Court set it aside and entered judgment for defendant, notwithstanding the verdict, upon the ground that plaintiff in any event was bound to have the bricklaying done under his contract with the subcontractor, and that defendant's promise to pay him $350 in the circumstances mentioned was without consideration. As plaintiff was not bound to perform for defendant, but only to perform his subcontract with Bernstein, there was consideration for the agreement with defendant to pay the increased wages and start the bricklayers immediately, something he was not bound to do for the general contractor."

Contractor Obligated to Pay for Material Furnished Subcontractor

Holding that a drainage contractor was bound for payment for materials furnished a subcontractor, despite omission of the contract to so provide expressly, the Arkansas Supreme Court said in the recent case of Kotchtitzky vs. Magnolia Petroleum Co., 257 Southwestern Reporter, 48:

"Even though the contract contained no express provision to pay for any or all work or labor performed or material furnished for the construction of said improvement, . . . nevertheless the contract for the construction of the improvement by the appellant carries with it an obligation, by necessary implication, upon the part of the appellant, to furnish the labor and materials necessary to make the improvement which the appellant expressly contracted to construct. . . . It is wholly immaterial under the statute so far as his liability is concerned whether he furnished the material and did the work himself or whether he sublet it to another."

It is to be noted, however, that the decision seems to some extent to have been influenced by a local statute, for the Court apparently uses statutory language in the following quotation:

"These implied obligations of his contract under the statute are equally as binding upon him as if the contract in express terms had contained the provision that 'the contractor shall pay promptly when due for all work and labor done and material, machinery, appliances and supplies of every nature and kind and used in and about the work contemplated in this contract.' "

Owner's Liability When in Control of Building Operations

An owner contracted with different contractors for construction of various phases of building, there being no general contractor. A contractor for masonry constructed a runway out of materials furnished by the owner, to furnish means of communication from the street to the buildings, etc. This runway was left on the premises and, while using it, plaintiff, an employee of steam fitting contractors, was injured through a defect in the same. Reversing a decision which had been entered in favor of the owner, in a suit brought against him on account of the accident, the Appellate Division of the New York Supreme Court said in the case of Shanahan vs. Crestonia Construction Corporation, 202 New York Supplement, 785:

"The decision of the court below evidently was based upon a general statement in Joyce vs. Convent Ave. Cement Co., . . . which reads as follows:

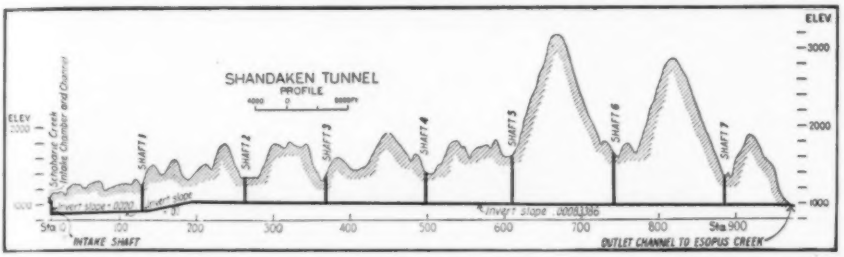
" 'It is now well settled that the owner of premises, who contracts for the construction of a building thereon, owes no duty of active vigilance to protect the employees of one contractor from the negligence of those of another, and that to the employees of the various contractors the only liability on the part of the owner in such case is for some affirmative act of negligence on his part, as by taking some part in the performance of the work other than such general supervision as is necessary to insure its performance in accordance with the contract.' . . .

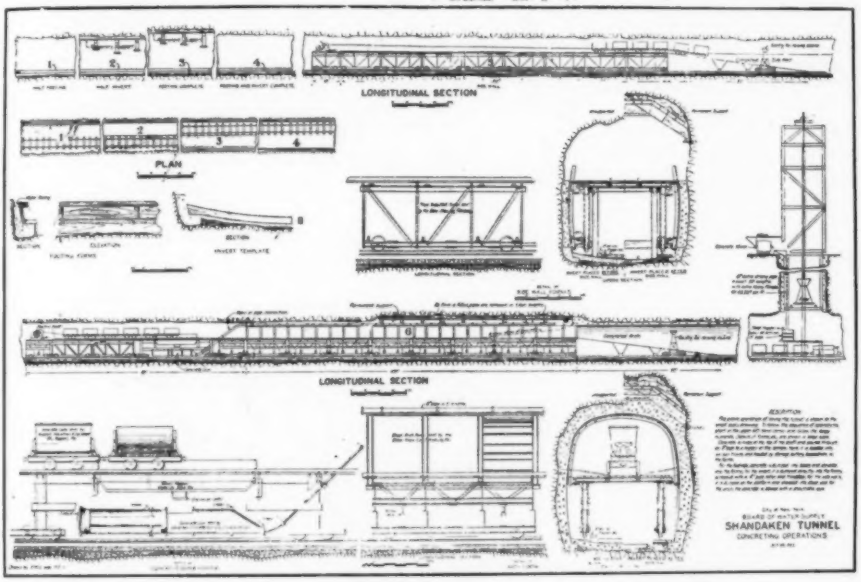
"The Court clearly did not intend to absolve the owner from all liability to and duty towards the employees of the contractor in such a situation. . . .

"The evidence in this case would have permitted the jury to find that the defendant adopted the runway as its own and permitted subsequent contractors to use it. . . . Under these circumstances the defendant would have been liable for any defect in the runway, which existed for a sufficient length of time to give the defendant notice thereof, and which it had not remedied. The general control of this building was at all times in the defendant, and if the defendant permitted runways and similar constructions erected by one contractor to be used by subsequent contractors, its relation thereto became the same as if constructed by it, except that it could not be charged with defects therein until it had notice thereof and opportunity to repair."

Contractor's Plant on Shandaken Tunnel

New Link in New York's Water-Supply Put into Service on February 9, 1924

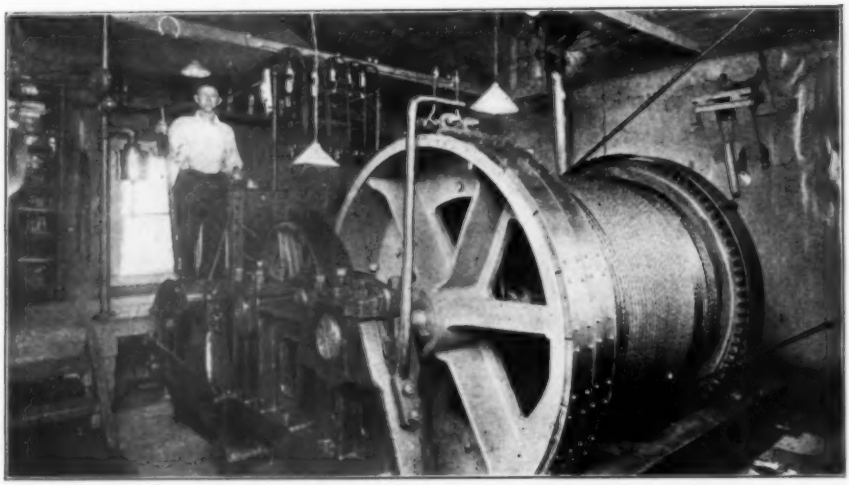






EQUIPMENT USED TO GRADE THE SPOIL BANK AT SHAFT 6

When the bank was not too high, the dragline was used with the boom. Sometimes, however, it was necessary to fasten a block to a cable on top of the bank and pass the dragline of the Erie shovel through it



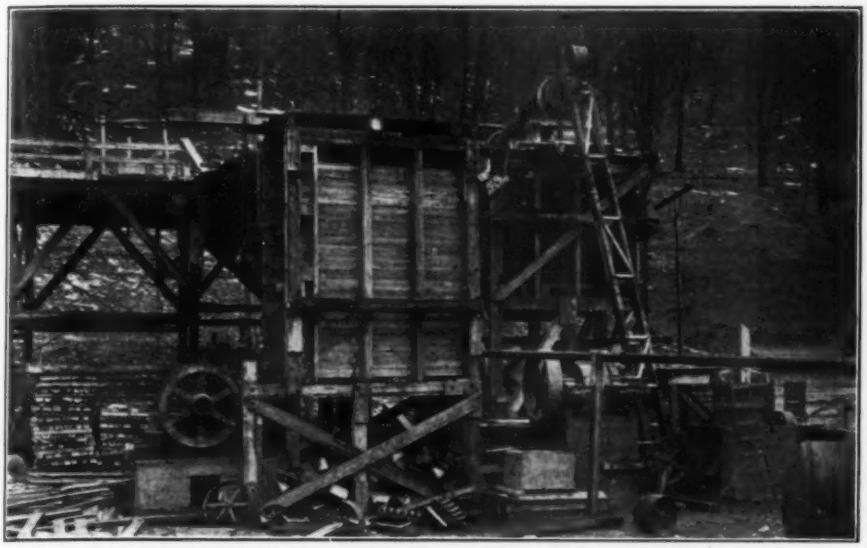
HOIST HOUSE IN THE PRATTSVILLE DIVISION, SHAFT 1

The Flory electric hoist has a drum 4 feet 6 inches in diameter and was balanced by one cable ascending while the other was descending. Full control was obtained by a solenoid brake and a hand brake. In case of an overload or of anything happening to the cages, a switch at the right of the operator's head could be thrown out, thus setting the solenoid brake. A circuit breaker was also installed which in case of an overload would automatically throw the switch out. The hoist was driven by a General Electric 112-horse-power, 440-volt, 60-cycle, 154-ampere, 3-phase induction motor at a full-load speed of 450 revolutions per minute. The motor is not shown in the picture, but was directly back of the hoist



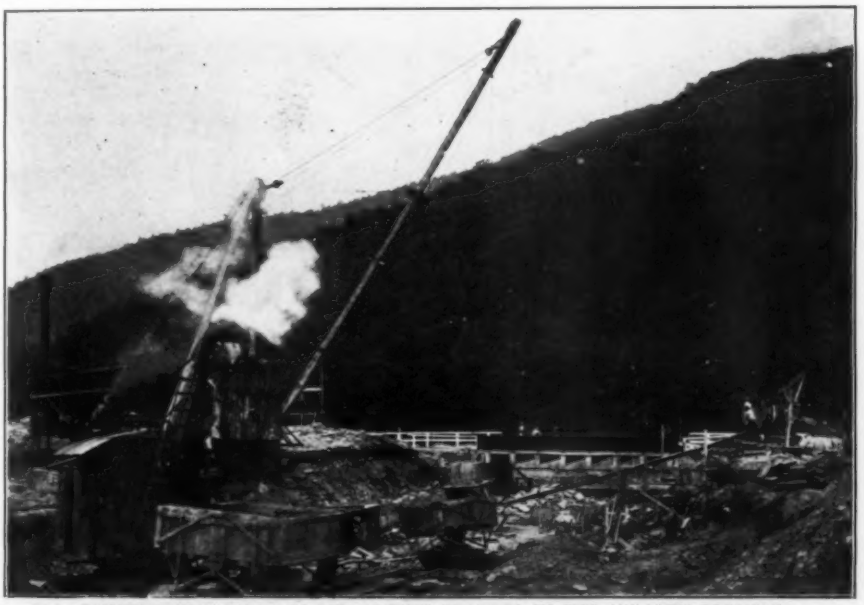
VIEW OF THE SHAFT HEAD OF SHAFT NO. 6 WITH BUCKET IN POSITION TO BE LOWERED

A rock cut of a maximum depth of 40 feet was made before the contractor started to sink this shaft. The power-plant of this shaft, while not shown, is located to the left of the picture



CRUSHING PLANT AT SHAFT 4 IN THE ALLABEN DIVISION

At the left is the main Farrell 30 x 13-inch crusher. At the right of the crusher is the muck bin, stone from which is carried directly into the crusher. To the right of this is the Traylor Sand Roll, 30 x 14 inches, and farther to the right is a Traylor 8-inch Bull-Dog gyratory crusher. The inclined frame between these was used for the bucket elevators which carried the product of the main crusher to the screen, shown at the top of the picture. The bin under the screen is for sand and stone. The pipe is the main air line from the compressor to the shaft



CONSTRUCTION WORK IN THE OUTLET CHANNEL IN THE ALLABEN DIVISION

At the left the steam shovel is shown excavating the channel and loading into the five dump-cars which were hauled up an incline by a hoisting engine. A steam dinkey then hauled the cars to the dump pile about 500 feet to the left. The Lakewood ½-yard mixer at the right is shown discharging concrete through a chute into a bucket. The derrick was then used to place the concrete in the retaining wall at the left. The retaining wall at the right was built directly with the chute. The new highway bridge over the channel is shown in the background



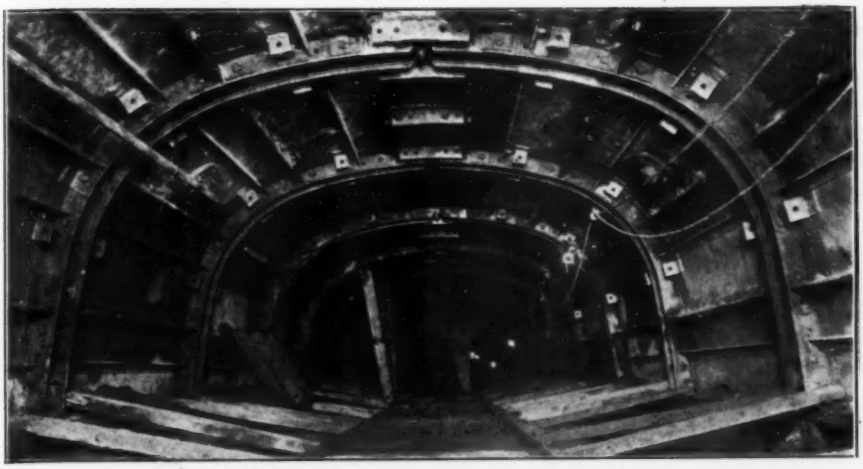
EXCAVATING A BENCH IN CLAY FOR THE ALLABEN DIVISION OF THE SHANDAKEN TUNNEL

In the back at the top can be seen the timbering which supports the roof of the tunnel leading to the heading, which is from 50 to 75 feet in advance of the bench. The water coming from the pipe is the seepage water collected in the heading. The man at the left is using an Ingersoll-Rand B.C.R. No. 430 drill to pry out chunks of clay, and the man at the right is using an Ingersoll-Rand No. 56H clay digger



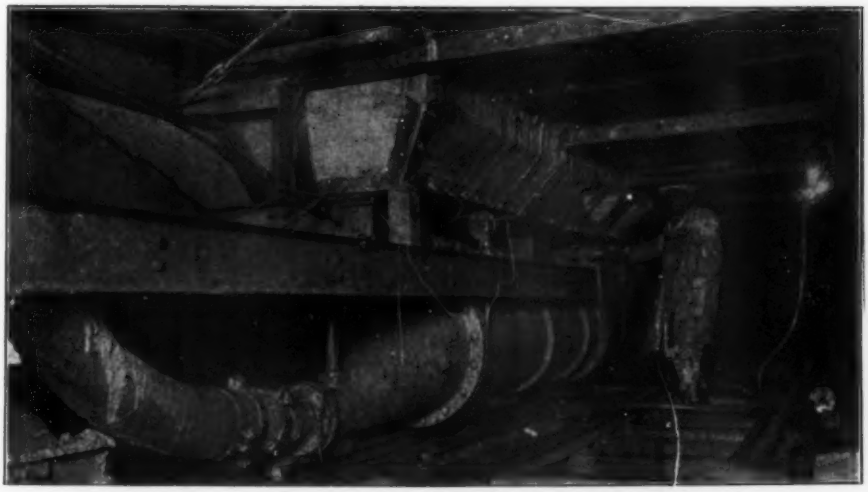
MUCKING OPERATIONS IN THE ALLABEN DIVISION OF THE SHANDAKEN TUNNEL

This view, looking south, shows the Myers-Whaley mucking machine in operation. The heavy bucket at the front of the machine picks up the rocks and clay, quickly tossing it to the conveyors in back, which carry it to the motor-drawn industrial cars at the rear



INTERIOR VIEW OF THE ARCH FORMS USED IN THE TUNNEL ON THE ALLABEN DIVISION, BETWEEN SHAFTS 5 AND 6

The Blaw-Knox forms about which the concrete is placed by the concrete gun shown below are made with the key plate omitted about every 20 feet so that the sections of pipe through which the concrete passes may be taken out. Concrete is placed at the farther end of the form first, that is, the part farthest away from the gun, and as the form fills, sections of the pipe, which are in lengths of 5 feet, are removed. Approximately 120 feet of arch was placed in 8 hours in the untimbered tunnel, and in the timbered portion of the tunnel, where the quantities were larger, the time required was 10 to 12 hours



PLACING THE CONCRETE IN THE TUNNEL ARCH BETWEEN SHAFTS 5 AND 6

The concrete was drawn from 1-yard cars over the platform shown at the top of the picture and dumped into the hopper at the left and then fed into the Universal concrete gun through the smaller chute shown in the center of the view. About 8 cubic feet comes through in a batch, about half filling the gun, which is 24 inches in diameter. The plunger is forced through, closing the opening, and air is then admitted to the batch at two points, one at the top of the cylinder, and the other through the pipe which can be seen just to the right of the point where the hose is connected. A pressure of 50 pounds per square inch is used, which forces the concrete through the 8-inch rubber hose at the left into the pipe which extends along the top of the arch forms. When the pressure has been brought to about 25 pounds, the batch is discharged and the plunger is brought back to its original position by air pressure. The gun, hopper and platform are all attached to the forms and run on tracks so that the whole apparatus can be moved forward when needed



GROUTING A PORTION OF THE SHANDAKEN TUNNEL OF THE ALLABEN DIVISION, BETWEEN SHAFTS 5 AND 6

A battery of Canniff grouting machines was used to grout on this section of the tunnel



A COMPLETED PORTION OF THE SHANDAKEN TUNNEL IN THE ALLABEN DIVISION BETWEEN THE OUTLET AND SHAFT 7

The flashlight in the background is intended to show more clearly the shape of the tunnel



THE CONTRACTORS HAD TO KEEP THE ROADS CLEAR FOR WINTER OPERATION

Baker snow-plow and Holt tractor used on the Allaben Division of the Shandaken Tunnel to make possible the hauling of materials and food to the tunnel operations after heavy snowfalls

Recommended Minimum Requirements for Masonry Wall Construction---Part III.

Par. 15. Heat Transmission of Masonry Walls

Extensive experiments at the Bureau of Standards with brick masonry walls of various thicknesses and types of construction have shown that an 8-inch solid wall will prevent heat transmission to an extent threatening combustion of highly inflammable materials, for a period considerably greater than the duration of the average fire. The walls were tested according to the Fire Test Specifications tentatively adopted by the American Engineering Standards Committee and approved by other organizations, and which, it is believed, approximate as nearly as possible the increase of temperature during a typical fire. Temperature on the outside of the 8-inch solid clay-brick wall did not rise to a point threatening combustion of inflammable material until from 5 to 6 hours after the tests were started, and heat transmission through a 12-inch wall was even slower. Walls of sand-lime or concrete brick transmitted heat less readily than walls of clay brick. Dangerous temperatures on the outside of 4-inch brick walls were reached in from 2 to 4 hours, but displacement due to unequal expansion was such as to indicate the possibility of undesirable cracks at an earlier time. Eight-inch hollow walls of brick afforded less insulation than solid walls, temperatures of 300° F. at the outer surfaces being reached in from 1 to 2 hours. Temperatures on the outside of 12-inch and 13-inch hollow brick walls were only 200° F. after 6 hours' test, indicating their reliability as fire-walls where 8-inch hollow walls are inadequate.

Temperatures in the centers of walls increase more rapidly than on the outside surface, and the results indicate that it is unwise to allow 8-inch party walls for large structures or those where fires of long duration are probable, if the joists are inserted.

Material deflections occurred in the walls thus exposed to fire, varying from two to five inches from the perpendicular at the centers of the panels. Unrestrained walls were more badly distorted than restrained walls and are less likely to come back to the original position. Twelve-inch restrained walls recovered practically all deformation on cooling, and 8-inch walls from one-half to two-thirds. Higher deflections and more serious cracks occurred with cement mortar masonry than with lime mortar masonry. The results indicate that from this point of view 12-inch restrained walls would be usable after a fire of average severity, and 12-inch unrestrained walls in some cases, while 8-inch walls, either solid or hollow, are apt to show permanent distortion, unfitting them for further use.

In view of the foregoing, the Committee has decided that walls thick enough to meet the general requirements for stability and compressive strength will be of sufficient thickness to withstand ordinary fire exposures and that except in the case of fire-walls in the larger buildings no account need be taken of resistance to heat transmission in deciding upon the necessary thickness of walls.

Par. 16. Factors Affecting Stability of Walls

Consideration was given to a number of factors which, by affecting the stability of brick walls, exert an influence on thickness requirements additional to that of unit working stress considerations. Building codes frequently recognize the importance of these factors by calling for greater wall thickness or other precautions where their influence is thought to be dangerous, and the Committee feels that an expression of opinion as to their relative effects on stability will be useful.

Foundation Conditions: The stresses and wall thickness recommended in Part II are based on the assumption that foundations will be sufficient to prevent settlement threatening the integrity of the wall. For the purposes of wall design it should be assumed that foundations are adequate and the wall is a unit. The subject of footing and bearing values of soil is under consideration for a later report.

Vibration: Ordinarily, vibration due to street or railway traffic, or to machinery within a building, does not seriously affect good brickwork. Where such vibration is excessive, however, or where there is possibility of earthquake shocks, extra care should be taken to anchor intersection walls together, and to tie the structural frame of the building to the walls.

Height and Width of Building: From a structural view-point no limits are recommended for the relation of height to width of building built with brick bearing walls. Under present conditions, such buildings are scarcely ever built over 6 stories, and for walls of this height the effects of greater or less width on stability is unimportant and increased wall thickness for narrow buildings unnecessary. For buildings with masonry walls or other materials than brick, the stated limitations on height render consideration of width unnecessary.

Methods of Anchorage: Regulations affecting the methods of supporting or anchoring floor timbers, or of attaching walls to intersecting walls or partitions are considered outside the scope of this report. In general, such connections should be rigid in nature; adequate to transmit such lateral stresses as may occur and to develop the full supporting effect between structure and wall, and of a design which admits release of the floor beam or slab in case of fire without serious resulting damage to the wall. If these conditions are met, the wall thickness permitted in Part II will be found sufficient so far as this factor is concerned.

Rigidity of Floors: The question has been raised as to whether, other conditions being equal, the rigidity of fire-proof or monolithic or mill-constructed floors does not differ sufficiently from that of joisted floors to justify different wall thickness for buildings of these types. The Committee has received no evidence tending to establish the importance of this difference. It has recognized the value of rigid interior construction in its required spacing of lateral supports (see Part II, Section 3), and will welcome an expression of opinion as to whether concession to wall thickness should be made for fire-proof or mill-constructed buildings as compared to joisted construction.

Influence of Span: Many building codes establish limits of span for floors supported by bearing walls, requiring a greater wall thickness where such limits are imposed. This practice is believed to date back to the era when working stresses for masonry were not limited directly, but by controlling the live loads likely to come upon the walls. Where masonry stresses are kept within the limits prescribed in Part II, the span of floor beams should not affect the required thickness of masonry walls.

Fire Exposure: Results of an extensive fire test series at the Bureau of Standards, made with full-sized wall panels of various thickness, indicate clearly that if sufficient provision is made, as in Part II, for bearing strength and structural stability, fires of the usual duration and intensity will not seriously displace 12-inch brick walls. In the case of the 8-inch wall permitted for residential buildings 3 stories in height, and top stories of other buildings, the consequences are considered to be unimportant even if failure should occur.

Wind Pressure: No evidence has been received indicating that where the structural framework of a building affords reasonably rigid support to the enclosing walls, the pressure resulting from maximum wind velocities in most parts of this country is an important factor in wall design. Neither an 8-inch nor a 12-inch wall of any considerable height has the inherent stability to resist high wind pressures, but if the building enclosed possesses sufficient mass and stiffness to resist collapse as a whole, it appears that, so far as wind pressure is concerned, even the lesser wall thicknesses may be employed freely within the limits prescribed in Part II.

Percentage and Arrangement of Openings in Wall: It is customary in about one-third of the codes now in force to require that bearing walls be increased 4 inches in thickness when a certain percentage of the wall section (varying in different codes from 25 to 55%) in any horizontal plane is removed for openings. This practice is considered to be a survival

from the period when maximum masonry stresses were not prescribed and the increase of thickness was required to take care of possible overloads in walls thus reduced in section. If the compressive stresses in masonry walls and piers are kept within the limits prescribed in Part II, and if serious eccentricity in loading piers and short wall sections is avoided, it is believed that it is unnecessary to require increases in wall thickness on account of openings.

Par. 17. Height of Brick Piers

The compilation of tests of brick masonry piers, previously mentioned, disclosed very little difference in the strength of piers 5 diameters and 10 diameters in height, other conditions being equal. Not enough data are available by which to establish the relative strength and stability for piers of greater slenderness ratio.

Par. 18. Lining Existing Walls

The Committee advises strongly against the practice of lining old walls to permit of their use under a higher classification, and has made no provision in its recommendations for such action lest it should operate to place a premium on use of old buildings.

Par. 19. Arches and Lintels

Openings for doors and windows should have well-buttressed arches or lintels of masonry, or of metal with bearing at each end of not less than 4 inches on the wall. On the inside of openings less than 4 feet wide, in which the thickness of arches and lintels is less than that of the wall supported, timber may be used, which will rest at each end not more than 2 inches on the wall and may be chamfered or cut to serve as arch centers.

Arch lintels may be constructed successfully of hollow tile, but the most practical form of tile lintel is made by butting a sufficient number of tile end to end, filling the cells with concrete, and inserting reinforcement rods in the lower tier of cells, thereby obtaining the effect of a reinforced concrete beam. The coarse aggregate for such filling should not exceed ¼-inch diameter.

Par. 20. Quality of Clay Hollow Building Tile and Hollow Concrete Block

During the last two years compression and absorption tests of clay hollow building tile from 28 scattered sources have been made by the Bureau of Standards. Freezing tests are also being made on tile from 18 sources. Basing judgment on structure, strength and freezing effects, tile from all but four sources could be used in a wall exposed to the weather. The absorption of each of these four lots of tile was above 16 per cent. Stucco should not be considered a protection for exposed walls, as the weather effects with stucco are as bad, if not worse, than on the bare wall.

All of these absorption figures were based on determinations with specimens which had been saturated by boiling five hours.

The Bureau's experience is that the determination of absorption by boiling is preferable, as it requires less time and gives more definite and conclusive results. For sampling, the method given in the Tentative Specifications for Hollow Building Tile of the American Society for Testing Materials is recommended. Tile having an average absorption greater than 16 per cent should not be used in a wall exposed to the weather, or in foundation walls. As different types of clay are used in the manufacture of hollow building tile color should not be taken as indicative of percentage absorption or quality.

The crushing strength required for acceptable concrete block and tile is justified as being within the average demonstrated strength of the material, also by the fact that the comparatively thick shells and webs of such blocks afford a better distribution of stress in mortar joints.

For purposes of code enforcement it has been found desirable that concrete units be marked with the manufacturer's distinctive brand, and that the product be tested from time to time by a reliable laboratory. Directions for standard methods of testing concrete blocks can be obtained from the Secretary of the American Concrete Institute, 1807 E. Grand Boulevard, Detroit, Mich.

Complete specifications for testing clay hollow building tile are being prepared by a Committee of the American Society for Testing Materials and will probably be approved by that organization at its next annual meeting, after which they should be utilized for purposes of code revision.

Par. 21. Working Stresses for Hollow Walls

After thorough consideration, the working stresses for tile laid with cells vertical and those with cells horizontal have been set at the same figure. It is believed that the more complete and uniform bedding of tile laid with cells horizontal offsets the greater strength of the units when tested with cells vertical. The stresses given in Section 12 will in almost all cases permit utilization of tile to the full limits of height and thickness permitted, and the factor of safety involved is considered adequate.

The Committee's investigations have shown the desirability of thorough tests, by responsible authorities, of the relative strength of tile walls laid both with cells horizontal and vertical. Such a series of tests is now in progress at the Bureau of Standards and it is hoped that the results will be available before final publication of this report.

Recent tests by the Bureau of Standards indicate that hollow walls of brick laid in all-rowlock bond have practically the same compressive strength as solid walls of the same thickness when loads are applied eccentrically. In the absence of fuller information, and of experience with its possibilities for large buildings, the Committee hesitates to approve its use for heights or stresses exceeding those prescribed in Part II.

The Committee limits its recommendations for use of hollow walls of brick to the type built with alternate headers and stretchers in each course and known as "all-rowlock bond," until it obtains sufficient information on the merits of other types to justify their recognition.

Par. 22. Walls of Rubble or Cut Stone Masonry

1. Where cut or squared stone of small size, such as quarry wastes, are used to lay up solid walls of moderate height, the thickness should be not less than that required for solid brick walls.

2. The maximum stresses prescribed in Part II for cut stone masonry apply primarily to thin walls. Where used for walls of greater thickness, these working stresses can be much increased, even to a large percentage of the bearing strength of the stone.

Par. 23. Fire-Walls

1. Observation of the behavior of tile and concrete block walls under fire exposure discloses that plaster applied to both surfaces is of considerable value in delaying failure. Plaster also adds somewhat to the compressive strength of tile walls, though not in proportion to the thickness added. Its use on tile and concrete block walls is advocated, especially in the case of fire-walls.

2. It is recognized that the requirements of Part II would permit the top story of a fire-wall in an industrial building to be 8 inches thick with joists inserted, and, furthermore, that the permitted use of an 8-inch fire-wall for the upper 20 feet in a residential building of the multi-family type is somewhat more liberal than its use to separate two-family dwellings as approved in a previous report. The Committee is divided as to the advisability of these proposed requirements and will welcome an expression of opinion regarding them.

Par. 24. Parapet Walls

To satisfy architectural considerations, the requirements for parapet walls have been omitted wherever possible. When not provided along the edges of flat roofs on high buildings, iron railings or other suitable barriers should be furnished for protection of firemen and safety of occupants.

Unless carefully moisture-proofed with stucco or other protective material, clay hollow building tile are undesirable for parapet walls in parts of the country where freezing conditions occur. When not thus protected they are apt to become filled with water, which may freeze and break the tile.

Par. 25. Foundation Walls

It has been customary to require that foundation walls be made thicker than those immediately above them. The Committee does not believe this necessary in all cases. A foundation wall acts both as a bearing wall and a retaining wall. As a bearing wall it has few or no openings as compared to those above it, and its compressive stresses are usually lower. As a

retaining wall it owes practically all its stability to the weight resting upon it, and except in very thin walls the addition of 4 inches of thickness has little effect. Where analysis of the forces acting upon it discloses combined stresses greater than those provided in Sections 4 and 12, Part II, or where they may cause tension in the masonry, the thickness should be increased.

Foundation walls of tile should be waterproofed with cement plaster or other effective means, and unless surrounded by sand or gravel, or otherwise naturally drained, should have open tile drains around the footings on the outside, and discharging into an outfall at lower levels.

Furnishing Ready-mixed Mortar

Here Is Another Idea for Making Money from a Deposit of Sand

THE production of ready-mixed mortar is a comparatively new industry which is being approved by builders who seek to improve their work. This wet mortar, prepared at a central plant, appeals to contractors because it saves them the bother and inconvenience of mixing the sand and lime on the job, and because it insures a better product, made under controlled conditions and with accurately determined amounts of the component materials.

A number of these wet-mortar plants have been established in various parts of the country, especially on the Pacific Coast. They are, as a rule, located in fairly large centers where rapid deliveries can be made.

A typical example of this new enterprise is the plant of the Atlas Mortar Company, near San Francisco. This plant was started five or six years ago at the foot of Holy Cross Mountain, where a deposit of clean sand was available for use in making the mortar. The Atlas Mortar Company produces its own sand from this deposit at low cost.

Working the Sand-Pit

The power drag scraper which digs the sand is a 1-cubic-yard Le Clair type, operated by a 50-h.p. electric hoist. The bucket works over a span of 300 feet, and produces from 200 to 300 cubic yards in a day's run. The sand is scraped into a screw-conveyor which feeds it into an elevator delivering the material to a bin at the top of the plant.

The scraper outfit was installed in the summer of 1921, and since that time the only repairs have been shackles for the front bridle hitches. When the plant was established, lime was purchased from other producers, but the company now owns and operates its own kiln at a point near San Francisco, where lime is burned and then shipped to the plant.

Handling the Quicklime

The wet-mortar producing method calls for the slaking of quicklime, the aging or curing of this lime over a period of time, and the mixing of lime putty and sand to form the finished product. The slaking is done in a long steel tank, where water is added and the material thoroughly agitated. It is then carried to one end of the slaker, where it is drawn off and passed through a screen which takes out all solid matter.

After the slaking, the lime goes to vats in which it is stored for a period of time while it cures, gradually acquiring the qualities necessary for lime mortar. While it is curing in these vats, the slaked lime is stirred periodically by a traveling agitator.

Mixing the Mortar

At the end of this aging period the lime putty is pumped out of the vats and elevated to a lime bin at the top of the plant. Then the desired quantities of this putty and of sand are drawn out of the bins and run through a mixer, in which the materials are uniformly and thoroughly mixed. From this machine the finished mortar is run into vats, from which it is loaded into delivery trucks.

The trucks used to haul this ready-mixed mortar are of an interesting type, having steel dump bodies with a covering built up a short distance from the edges to keep the load from slopping over at the sides. The truck dumps by a rear gate. When the load is being hauled, a small trough is placed under the bottom of the gate to catch any leakage. This is a necessary precaution to prevent leaving a trail of drippings on the city streets. On the return trip the trough folds under the truck.

Besides the building mortar, the Atlas Mortar Company is developing a lime plaster trade. A good material for this use is obtained by filtering the lime putty as it comes from the vat, to remove a large part of the water and produce a material ready for application on the walls as a finish coat.

Chicago Warehouse for Good Roads Machinery Co.

IN order to give better service to customers, the Good Roads Machinery Co., Inc., Kennett Square, Pa., has established a warehouse in Chicago at 49th and Halsted Streets, where it will carry a complete stock of road-building machinery and parts, making possible quick shipments of repair parts.

Distributors Establish Warehouse in Providence

HEDGE & MATTHEIS COMPANY, 50 Dorchester Avenue, Boston, Mass., has established a warehouse at 196 West Exchange Street, at Aborn, Providence, R. I. This warehouse will be under the personal direction of Joseph M. Murphy, District Sales Manager.

Codification and Standardization of Federal Contract Laws

By Gordon A. Ramsay

Davis, Ramsay, Kelly and Kracke, Chicago, Ill.

THE duty of the Federal Bureau of the Budget is to see that the money appropriated by Congress is expended wisely and economically and to determine whether requests made by departmental heads for funds to carry on their activities are reasonably in accord with the policy of the President and whether the condition of the Treasury will justify the approval of the request. Millions of dollars of taxpayers' money appropriated annually by Congress to meet the requirements of the government departments are obligated and disbursed pursuant to the terms of government contracts. Any comprehensive plan for securing economies in expenditure and reducing taxes must deal with the methods employed in obligating and disbursing government funds under these contracts. So great is their number and so extensive their variety that uniformity of procedure must be assured and wasteful practices eliminated in their negotiations, terms, execution and settlement. In order to meet this situation, the Interdepartmental Board of Contracts and Adjustments was created by direction of the President. Every government department and establishment was directed to organize a similar board. Chairmen of these boards, representing approximately 30 departments and establishments of the Government, constitute the Interdepartmental Board.

The functions of this board are: first, to standardize forms and methods of contract-letting with a view to fostering economy and promptness and minimizing hazards to be assumed by the contractor which have hitherto increased the cost of government work; second, to recommend general policies in the settlement of outstanding obligations; third, in an advisory capacity to review important contracts, advise concerning the interpretation of contracts, and assist in their negotiation. The lack of coordination and of uniform contract procedure, not only between the numerous departments of the Government, but also between the different bureaus of the same department, has cost the Government millions of dollars.

Private parties bidding upon government contracts were constantly confronted with varying conditions and obligations to be met, dependent upon the procedure or whim of the particular department or bureau. Many of the contract forms contained numerous clauses with involved language of doubtful interpretation. One contractor, bidding on government work, figured the cost, including a reasonable profit, and then added $10,000 to his bid. One of the government agents said to him, "I do not understand why you add $10,000 to your bid." The contractor replied, "Because I do not understand your contract. There are ten paragraphs of doubtful meaning and I have added $1,000 per paragraph to play safe."

In coordinating government contracts, it is necessary to consider questions of policy as well as purely legal matters. For example, the Government had asked for bids for an excavation in Arkansas and published the result of about 50 government borings on the property showing only sand and gravel. Another document which became a part of the contract contained a statement that the contractor would be required to acquaint himself with the character of the site. The contractor put his steam shovel to work and discovered that at some previous time a tremendous flood had laid down large quantities of tree trunks, many feet below the surface of the soil, making it impossible for him to use steam shovels. These trunks had to be taken out with teams and with hand labor. He finished the job and

Cutting "Red Tape"

Cutting red tape in government contracts was the task assigned Gordon A. Ramsay, Chicago lawyer, when he was called to Washington by General Charles Gates Dawes, the first Director of the Bureau of the Budget. Mr. Ramsay was appointed Assistant to the Director, and his specific work was to become Chairman of and to organize the Interdepartmental Board of Contracts and Adjustments, a board to "humanize" contracts between the Government and the people who do things for the Government.

Mr. Ramsay has succeeded in securing the adoption of the first standardized government contract ever adopted by our Government—a government lease, which is now used by all the departments where the Government is a tenant, eliminating all of the unfair clauses heretofore included, notably the clause giving the Government only the right to cancel without cause on thirty days' notice. The Government's rent roll approximates twenty-two million dollars per year.

made a claim for this extra cost, which was disallowed. The court decision held, probably fairly under the law, that, inasmuch as the contract provided that the contractor acquaint himself with the character of the site, the Government should not pay for this extra work. The contractor became a bankrupt, but if he or others who know of this incident figure on another government contract to do similar work, they will probably add enough to their bid to take care of such a hazard.

Under the law of averages, such hazards occur only in a very small percentage of cases, but is not the Government in the long run out of pocket by having to pay for the hazard in every such case? As a matter of policy, would it not be fair for the Government as owner to assume the risk of the hazard of its sites and have the contractor assume the risks of his equipment, plant and weather conditions?

The Interdepartmental Board is a clearing-house to which are brought contractual problems of the 30 or more agencies of the Government, where the whole picture can be seen and studied. A member from one department soon realizes that while he might have thought his was the only problem and his method the only real method, he is working for the Government as a whole, and through interchange of views, instructs, learns and cooperates to the Government's advantage. The policy of this board is to do everything in its power to secure closer cooperation, not only between the departments themselves, but also between the Government and those who have or should have contract relations with it.

A Move for Uniform Contract Procedure

One of the difficulties of preparing a uniform contract procedure for all departments is that many of the several hundred statutes relating to government contracts apply only to particular departments. Also, some of the statutory requirements now tend to hamper free contractual relations between the Government and its citizens. This is one cause of "red tape," resulting in higher cost for government work.

A compilation of these statutes contains about 224 relating to government contracts. Before the move for uniform government contracts proceeded far, it was realized that in order to do a good, workmanlike job, there would have to be a change in the law, so a carefully drawn public contract law has been recommended for enactment which will establish uniformity of contract procedure for all departments and which will repeal all conflicting statutes. The government contracting officers have very little influence with Congress to secure legislation of this character. Business men must insist upon such remedial legislation in Congress to help out the red tape they now criticise.

At the beginning of the work of standardizing government contracts, the policy was adopted that the contract must be fair, whether the Government has to lose a dollar or not in any one particular transaction, and that no unfair, one-sided, too-strict contract forms would be recommended. There is no reason why the Government should not deal with its citizens as fairly as two citizens can deal with themselves. However, there are laws passed by Congress from time to time, directing the manner in which government contracts shall be carried out. Some of these laws are necessary to protect the public treasury; some of them have become unduly restrictive, and that brings up the question of a new public contract law. You may criticise a government contracting officer on account of red tape, lack of ability and obsolete methods and it may not be the officer's fault, because he is not free to contract.

When the Interdepartmental Board finished a tentative form of contract for construction work, copies were sent to the principal engineering contractors and architectural staffs, chambers of commerce and other organizations, asking for suggestions and telling them in effect that their ideas were wanted and that it was the desire of the Board to draw the contract as nearly in accord with commercial practice as the law permits, merely safeguarding the interest of the Government in a simple, easily understandable agreement.

The suggestions received are being tabulated, and before a definite final contract form is adopted all the suggestions made will be given careful consideration and wherever practical will be adopted. A standardized economical form of government contract is important to every taxpayer, whether he be a contractor or not. You should take an interest even if you do not bid on government construction work, because outside of fixed charges, such as interest on the public debt, pensions, and pay-rolls, practically every dollar gathered in federal taxes is paid out under a contract. The Government is spending as much as one hundred million dollars a day through contracts. Even though standard contracts and a modern contract law seem uninteresting, they should be close to every citizen's heart, because the power to tax is the power to destroy, and the power and ability to waste public funds through these thousands of little taps into the big barrel, the Federal Treasury, if not checked would in time drain it. The work of the Interdepartmental Board in attempting to simplify contract procedure so that the contractor will be relieved of unnecessary hazards and the Government will get the benefit of lower prices, is of importance to every good citizen and taxpayer.

ACKNOWLEDGMENT.—From a paper read before the Fifth Annual Meeting of the Associated General Contractors of America, Chicago, Ill.

Have You Studied Pages 51, 52, 75 and 76?

Standardization in Yard Lumber Grading

Recommendations in the U. S. Department of Agriculture Circular 296 Should Prove Helpful to Industry

CONTRACTORS as well as lumbermen have realized for some time that lumber cut from different species of trees and used for the same purposes should not be dressed to different sizes and graded under specifications entirely different. It was this knowledge that induced the lumber industry to take up the question of standardization several years ago and that led to the study of the problem by the Forest Products Laboratory. The Department of Agriculture Circular 296 sets forth a clear picture of the present practice in yard lumber grading and presents a set of standard specifications which may serve as a guide for the lumber-producing, distributing and consuming interests in their efforts toward the creation of American lumber standards.

Many parts of these proposed specifications have already been incorporated in the recommendations thus far formulated by the central Committee on Lumber Standards and its affiliated organizations, and other portions have been recommended with such modifications as may facilitate agreement by the various interests. It is appreciated that there are difficulties to be overcome in the establishment of national standards, but compromise is necessary by the wide variety of interests affected, and the success of the standardization movement rests upon ultimate agreement by all.

An instance which illustrates the desirability of this attitude on the part of all who are interested in the success of the standardization movement has already developed. This is in reference to the dressed thickness of inch lumber. For this the Department of Agriculture recommends 26/32-inch and gives in this circular many reasons for this recommendation. The Central Committee on Lumber Standards, however, has agreed upon 25/32-inch as the minimum thickness, and this recommendation is to be submitted to the lumber trade shortly. Recognizing the large advantages to be gained by the establishment of reasonable standards, the Department of Agriculture is prepared to support general agreement on a minimum thickness of 25/32-inch and to recommend that it be given a fair and impartial trial.

The circular referred to is divided into two distinct parts, the first of which contains a discussion of the principles on which standard specifications are developed. Chief among these are the basis for standard grading rules, the principles considered in establishing standard sizes, and the method of establishing a standard nomenclature. The second part contains the basic grading rules, and standard specifications, and suggests shipping instructions, and definitions of defects and blemishes, and proposes standard nomenclature.

"Basic" and "Standard" Grades Defined

Under the discussion of "The Basis for Grade Standards," "basic grading rules" and "standard specifications" are first defined. "Basic grading rules" are described as those which harmonize into grades of equal quality, lumber manufactured in various regions from the same or different species of wood used for the same general purposes. They are the rules which separate the products of a typical log into quality classes on the broad principle of appearance—suitability for use, of each piece as a whole. They may be applied with slight change in the grading of finishing lumber and common boards, but require some modifications in order to be applied in the grading of other forms of yard lumber, such as flooring and siding.

"Standard specifications" are distinguished from "basic grades," first, in that they adapt the basic grades to various forms of yard lumber by such modifications as are required by the use to which lumber is to be put, or as may in the interest of conservation or economy be permitted without interfering with its use; and, second, in that they include the necessary clauses prescribing standard sizes and shipping instructions for each specific form of lumber.

It is also clearly shown that modifications of the proposed grading rules to fit different species of lumber are anticipated, but that this modification should not be such as to change materially the general qualities of the material admissible in each grade.

How Basic Grades Are Developed

Several reasons for the development of basic grades for yard lumber and at the same time clear indications of the feasibility of such grading rules are set forth in the circular. The facts that, while coniferous trees differ considerably in botanical characteristics, there are still greater similarities than dissimilarities between them from the standpoint of growth, and that lumber cut from them contains practically the same defects, are given as the first indications of the practicability of basic grading rules. That the various products classified as yard lumber are similarly used and that therefore this lumber must be very similar in nature, is next given as a potent reason why basic rules should be similar. The similarity in existing grading rules, which is clearly brought out in a simple chart comparing the various associations' grading rules as published with the basic grades proposed by the Forest Service, is also used to indicate this act.

Development of Standard Sizes

Standard sizes and the bases on which they are established are next taken up. Since to the ultimate purchaser there must be an association between finished sizes and board measures, an account of the development of the

board-foot standard and present-day sizes is first given.

The four factors which must be recognized as fundamental in establishing proper sizes for yard lumber are then discussed. The factors of economical lumber distribution and conservation of waste indicate that the smallest size consistent with good utilization that can be produced from lumber without waste should be prescribed. The effect of the requirements of use in the determination of size is recognized as being the most important factor. It is first established that the size of each form of yard lumber should be the smallest that can be used, from the general strength and utility standpoint and yet give a maximum service per unit of cost. It is then shown that the properties of breaking strength, stiffness, resistance to warping, and nail-holding abilities are the most important from the standpoint of use of yard lumber. The matter of sufficient thickness to meet the needs of remanufacture in box factories and mill-work plants is also considered.

From the standpoint of utility, the greater the width of lumber, the greater its value for practically any use. However, widths must conform to the dimensions possible under existing methods of manufacture, and the necessity of their being the same for finishing lumber, common boards and dimensions is shown.

The effect of present manufacturing practice on the finished size of lumber is next discussed. Under this heading are given the results of laboratory and field tests of the variation that occurs in sawing, shrinkage in seasoning, wood required for dressing, and general methods of sawing and conclusions as to the effect of the various items are presented.

Conclusions Regarding Sizes

From a consideration of all the elements of the problem as set forth, the following conclusions are reached: 1-inch lumber surfaced two sides should not be less than 13/16-inch thick; 2-inch dimension should not be less than 1⅝ inches thick, and the width of both when dressed on the edges should be ⅜-inch scant in widths up to 7 inches, and ½-inch scant on greater widths. These dimensions are described as applying particularly to finishing lumber, common boards surfaced two or four sides, and dimension. It is recognized that various other forms of yard lumber, such as flooring, ceiling and siding, must meet different requirements of use. Each of these products is discussed and the reasons for prescribing the final dressed size for each are given.

Following this is a discussion of the basis for standard nomenclature, standard grade marks, and the shipping weight of lumber. These conclude Part I of the circular.

Method of Presenting Specifications

Part II contains the highly developed grading specifications which the Department of Agriculture is recommending to the lumber industry as a basis for its standardization program.

In presenting these specifications, the Department adheres to established principles in lumber grade specifications, but follows them to their ultimate conclusion. The Forest Products Laboratory recognized early in its study that underlying present commercial grades was an expression of the collective judgment of manufacturers, distributors and consumers of lumber, and that therefore the problem of producing standard grading rules was not one of formulating specifications altogether new, but rather a work of harmonizing existing grading rules into a grading specification that should be definite and concise yet sufficiently elastic to permit the use of judgment on the part of the grader applying the rules.

For these reasons it followed the method used by the larger lumber manufacturing associations of the country, of establishing the grades by definitely limiting the quality of poorest pieces admissible in each grade. Rules developed on the basis are not intended to supplant common sense in the application of grading rules; in fact, judgment is recognized as a necessary qualification of the good grader. The aim is to provide a sound foundation on which judgment in grading may be developed, and to make possible clear-cut decisions on disputed questions.

The rules contain one innovation which should prove especially valuable in the standardization program, because it recognizes a principle on which all grading is actually performed and because it makes for simplicity when once understood. This is the principle: that just as the grading of different species used for yard lumber is or should be essentially the same, the grading of different forms of yard lumber such as finishing, flooring and siding is also essentially the same from the standpoint of general quality. In other words, the general quality of a piece of B grade Finishing is the same as that of a piece of B grade Siding, but differences in the use of the two forms of lumber, or the effect of differences in the pattern to which the two are dressed, make necessary minor modifications of the general grade to meet these particular conditions.

The Basic Grading Rules

Following out and applying this principle, "Basic Grades" are first given in Part II together with general instructions for their interpretation. In order to provide a background for the basic grading rules and a means for visualizing the relation of one grade to another, a diagrammatic summary of the basic grades for yard lumber is given.

Following this, each of the basic grades is described in detail. In all, 9 basic grades are provided, 4 in the Select group and five in the Common group.

It is not anticipated that all associations manufacturing lumber will use all 9 grades, since the character of the lumber manufactured often does not warrant its separation into this number of quality classes. The rules provide that a combination of any of these grades will be made to fit circumstances of this sort.

Standard Specifications

The basic grading rules contain no provisions relative to rough or finished sizes, the percentage of short lengths permissible in random length shipments, or special instructions applying to the grading of each product. Regulations of this sort differ with the different forms of yard lumber and are stated under the "Standard Specifications" for each of the following forms of "Yard Lumber":

Finishing
Casing and base
Molding
Flooring
Ceiling and partition
Siding
Common board
Dimension
Factory flooring

The various clauses required for a complete specification are arranged under each product listed above in a regular order. First, the material to be graded under each heading is given. Following this is a tabulation of nominal and dressed thicknesses and widths and the standard lengths for that special product. Next is found a section giving the standard shipping practices. These cover the method of bundling and the percentage of short lengths permissible in random-length shipments. In this matter the percentage allowed increases as the grades decrease in quality. Next are found the definitions of what is meant by Flat or Vertical grain material and such terms as "Heart" and "Heart Face" if these classifications are applied to the product. A tabulation of grade names and the basic size of piece on which the grade of each form of material is determined usually follows.

Next in order under the standard specifications for each product is found a comparison between the grades of the form under consideration and the basic grades. This is actually a statement of the modifications of the basic grades made necessary by the form or use of the particular product. For example, under "Flooring" paragraphs 73 to 79 we find that A Flooring is the same as A Basic grade, and that B flooring corresponds to B Basic grade, except that a medium pitch streak will be permitted and that in 3-inch flooring the maximum knot is restricted to 1¼-inches. The grade of C flooring corresponds with C Basic grade without modification. No. 1 Common Flooring is shown as a combination of D and No. 1 Common Basic grades. In the same manner the grades of each product are correlated with the basic grading rules.

Following the comparison are given the special provisions referring to all or several grades of the particular product. For example, in paragraph 80 under "Flooring" we read that "the reverse side of a piece must be of such a nature as not to cause waste in No. 1 Common and better grades" and that "medium crook will be permitted in all grades of flooring except A."

In this manner the grading of each separate item of yard lumber is referred back to the corresponding basic grade. Since this is the mental process going on in the mind of every grader working on lumber, whether he recognizes it or not, the establishment of the standard grading rules on this basis should prove particularly helpful in the whole movement.

Shipping Instructions, Definitions and Nomenclature

Following the standard grading specifications and, in fact, making an essential part of them, are found suggested shipping instructions dealing with standard and nominal sizes, methods of measurements and tally, general provisions covering the grades of lumber, seasoning and methods of bundling.

The next section, "Definitions of Defects and Blemishes," is one that is of especial importance in the whole grading scheme. In the grading rules themselves, standard defects are mentioned. A definition of the exact nature of the defect and limitations as to size are found in this section. They are arranged alphabetically and each is described first in general terms and then in specific terms.

Following the standard defect definitions is a proposed standard nomenclature for softwood lumber. Here are found arranged alphabetically by species the proposed common name for the lumber, the scientific name of the tree from which it is cut, and various other common names by which the lumber is sometimes known.

The next and last section contains proposed standard lumber definitions and abbreviations used in the trade. In addition, the circular contains a summary of standard sizes for different forms of lumber and 22 full-page illustrations of the various defects and blemishes in lumber.

The whole of Part II has been given paragraph numbers so that reference to any part of it may be made by the number shown in the left-hand margin. A standard form has been followed throughout in presenting the grades for each product, and such lists as are necessary under definitions of defects and proposed species nomenclature have been alphabetically arranged for easy reference.

One-Story Houses Lead in Russia

BUILDING construction in Soviet Russia, according to data recently compiled by the Commissariat of the Interior from building permits issued by 271 municipalities, and abstracted from *Economic Life* by the Eastern European Division of the Department of Commerce, is altogether of a primitive type. The total number of permits issued in 1922 called for the construction of 8,914 private dwellings, of which two-story houses of brick or masonry represented 1.4 per cent, the remaining 98.6 per cent of permits covering one-story houses of wood and other semi-permanent materials. No permits were issued for buildings over two stories in height. The small houses of simple construction predominated in large cities.

Building Conditions in the United States

Prepared by S. W. Straus & Company

Building Activities Slowing Up

FIGURES reported from 333 cities in the United States show that the volume of building permits issued in April indicate a general slowing-up in building activity. There was a decrease in these 333 cities of about 7 per cent from April, 1923. With New York excluded, the 333 cities would show a decrease of about 12 per cent. In the East 102 cities reporting show an increase with New York included, but if New York is disregarded the 191 remaining cities would show a decrease from April, 1923. In the South, 55 cities showed an increase of 8 per cent, but in the Central section 109 cities showed a decrease of 19 per cent, and in the Pacific West 67 cities showed a decrease of 2 per cent.

These returns would seem to indicate that practically every part of the country except New York City and a few southern cities has already felt the tendency toward conservative building operations. This is considered an excellent prospect for continued prosperity in the building industries, along normal lines. If contemplated building had continued at the rate which was reported in January, February and March, there would have been a grave scarcity of workmen, with attending increases in labor scales, and there would probably have been an increase also in the cost of building material. If caution is used by prospective builders during the next few months, it is believed that the building industry can be held along a stable, healthy line of progress and that the amount of work which must be done during the year will be distributed in such a manner as to give steady employment and to prevent any serious increase in the composite cost of buildings throughout the country.

SUMMARY OF APRIL REPORT BY REGIONS

No. Cities	Regions	April, 1924	April, 1923	March, 1924	Gain or Loss April-April	Gain or Loss April-March
102	East	$139,318,972	$134,435,048	$281,935,849	$4,883,924 +4%	—$142,616,877
109	Central	125,551,593	156,041,311	109,077,662	30,489,718 —19%	+16,473,931
55	South	31,455,319	29,104,029	27,010,126	2,351,290 +8%	+4,445,193
67	West	41,496,577	42,269,104	47,402,073	772,527 —2	—5,905,496
333	Total	$337,822,461	$361,849,492	$465,425,710	$24,027,031 —7%	—$127,603,249

TWENTY-FIVE CITIES SHOWING LARGEST VOLUME OF PERMITS FOR APRIL, 1924, WITH COMPARISONS

	April, 1924	April, 1923	April, 1922	March, 1924
1. New York P. F.	$48,904,589	$35,772,191	$37,951,208	$196,338,702
2. Chicago	33,493,605	61,814,965	17,076,560	26,712,900
3. Detroit	20,128,862	11,927,760	6,227,387	17,704,688
4. Philadelphia	18,946,260	19,729,815	11,363,610	15,736,560
5. Los Angeles	13,224,568	15,352,944	12,959,686	17,279,758
6. Boston P. F.	5,472,551	4,417,368	8,106,887	5,814,321
7. Cleveland	5,154,450	5,593,500	2,459,300	5,549,340
8. San Francisco	5,036,673	5,173,801	3,993,720	4,652,933
9. Milwaukee	4,998,903	5,719,888	3,005,591	5,079,081
10. Louisville	4,659,690	1,566,385	2,175,550	2,942,005
11. Baltimore	4,551,840	4,972,260	2,962,440	6,233,820
12. Cincinnati	4,117,375	3,852,865	2,291,140	2,307,710
13. Pittsburgh	3,584,333	4,191,487	2,127,510	3,653,955
14. Washington, D. C.	3,408,130	10,402,846	3,614,122	3,231,677
15. Minneapolis	3,221,480	3,882,840	4,959,860	1,835,010
16. Newark	3,171,655	2,655,121	2,089,112	3,843,783
17. St. Louis	2,810,065	3,890,805	2,114,921	2,560,825
18. Providence	2,618,500	1,893,300	2,433,200	1,579,100
19. Buffalo	2,531,000	2,520,000	2,045,000	3,447,000
20. Portland, Ore	2,519,275	2,523,330	1,865,970	3,247,290
21. Columbus, Ohio	2,512,500	2,131,500	2,120,500	2,330,300
22. Indianapolis	2,492,173	3,215,976	2,566,389	2,213,313
23. Oakland, Calif.	2,457,592	2,135,478	1,850,160	2,896,416
24. Denver	2,416,650	2,256,100	1,840,800	2,112,850
25. Toledo	2,413,913	1,638,525	536,880	2,117,685
	$204,004,782	$218,717,314	$140,280,566	$339,749,099

NOTE.—P. F. after cities indicates that figures are for plans filed instead of permits issued.

Plan to Put an End to the Irresponsible Contractor

ACTION to put an end to the gross losses being sustained by the public as a result of operations of irresponsible contractors in the construction industry has been taken by the Associated General Contractors of America. An attack was launched at their recent convention in Chicago against existing bonding practices under which agents of bonding companies are led to influence promiscuous bonding without regard for the standing of the contractors whose operations they undertake to insure. These practices are blamed for defaults and delays on hundreds of construction projects yearly which involve stupendous economic losses.

Specific remedies for this situation have been studied by a committee of this contractors' organization. The plan of the committee is to create conditions which cause bonding companies to bar incompetent contractors from undertaking operations, and thus to remove this source of unnecessary waste in the industry and reduce the price paid by the public for contract guarantees.

Should some cooperative action fail to modify existing conditions, a drive will undoubtedly be made for the reduction of bond premium rates, and efforts will be launched to establish competition in the contract surety field. Success in these efforts is said to be adequate to cause agents of bonding-houses to exercise greater care in writing bonds.

In a progress report discussing this situation, the contractors' committee, consisting of H. H. Wilson, Winston & Company, Harrisburg, Pa.; F. L. Cranford, F. L. Cranford Company, Brooklyn, N. Y.; A. J. McKenzie, McKenzie Construction Company, San Antonio, Tex.; G. B. Walbridge, Walbridge-Aldinger Company, Detroit, Mich.; E. H. Holladay, E. H. Holladay Company, Nashville, Tenn.; and J. C. Edwards, William Simpson Construction Company, Los Angeles, Calif., says:

"It is believed a long-suffering industry and public will not forever accept a closed market which assures premiums commensurate with imprudent practice, but will eventually demand that corporate underwriters either conduct their business in accordance with a sound system or else allow the field of contract bonding to be covered by other methods which will allow free play of natural economic laws. It is opportune to say that many architects, engineers and contractors have frequently expressed their 'unfeigned admiration' at the manner in which surety companies are reported to have been able to influence legislation in many states in the direction of specifying a surety company bond to the exclusion of all other methods of suretyship."

How Many Cubic Yards of Trench Excavation?

A Chart Which Facilitates Computation of Long, Narrow, Shallow Excavations

THERE are plenty of tables for computing large excavations, but very often it is desirable to know the number of cubic yards in long, narrow, shallow excavations, in which the depth is given in inches and the width and length in feet. The accompanying chart has been developed by W. F. Schaphorst to take care of excavations of this kind. The depth, column A, is in inches, while the width, column B, and length, column D, are given in feet. To determine the cubic yards of excavation, all that is necessary is to run two zigzag lines across the chart as indicated by the dotted line, and the number of cubic yards is instantly given in Column E. As examples of the use of the chart, the dotted lines drawn across it show that if there is an excavation 6 inches deep (column A) by 3 feet wide (column B) and 1,800 feet long (column D), the number of cubic yards is 100. A straight line is run through the 6 in column A and the 3 in column B, and the intersection located in column C. Then from the point of intersection, a line is run through the 1,800 in column D with another straight line, and the intersection with column E gives the answer of 100 cubic yards of excavation.

This chart will also take care of deep excavations. If the depth is 60 inches instead of 6, the same dotted line will give the answer as 1,000 cubic yards instead of 100; that is, if a digit is added in column A, a digit must also be added in column E. Likewise, if a digit is added in column B, a digit must be added in column E. Thus, the same dotted line would show that for an excavation 60 inches deep by 3 feet wide and 1,800 feet long, the number of cubic yards would be 1,000, or if the depth is 6 inches, width 300 feet, and length 1,800 feet, it would be necessary to add two digits in column E, because two digits were added in column B, thereby giving 10,000 cubic yards in column E.

Careful handling of this chart, which is similar to the use of a slide rule, makes it possible to easily take care of almost any rectangular excavation with surprisingly accurate results.

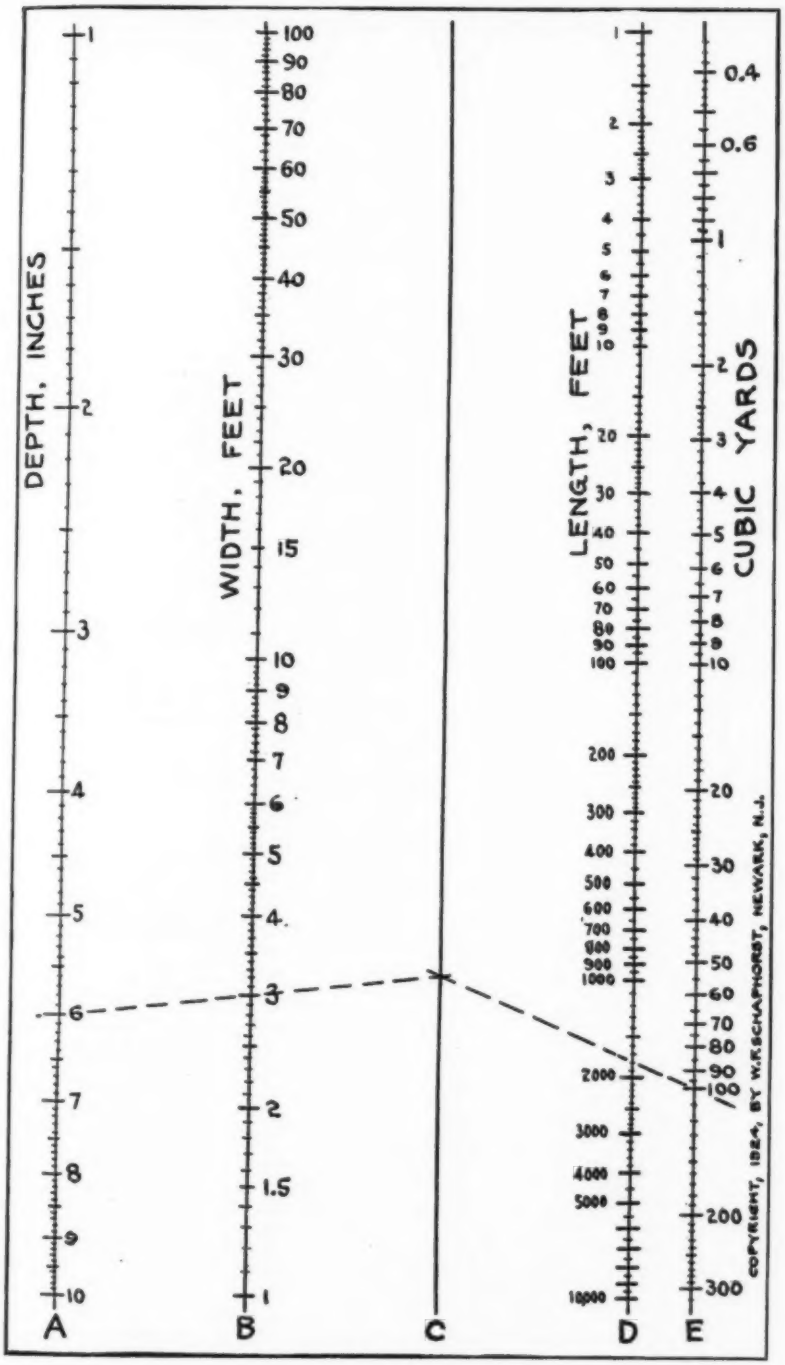


DIAGRAM FOR COMPUTING CUBIC YARDS OF EXCAVATION IN TRENCHES OF ANY WIDTH, DEPTH AND LENGTH

Winter Building Operations

By Alfred S. Alschuler

Architect, Chicago, Ill.

I HAVE made an analysis of various charts showing monthly operation over a period of years and have assembled this information in a new chart, shown on page 71. This chart indicates the average monthly operation over a period of years in the larger cities of the United States which are influenced by climatic conditions. It represents a very large percentage of the work done in the United States, and clearly indicates a season of tremendous activity from March 1 to October 1, a gradual decline for October and November, and a sharp decline for December, January and February. It is unnecessary to state the tremendous disadvantage affecting both capital and labor where such seasonal operation exists, and the desirability of overcoming this as far as possible. This condition varies considerably according to climate, but for present purposes I have assumed a belt or zone including Chicago and New York, under which conditions a very large proportion of the building operations of this country are carried on.

Office Building Projects

Office building projects in some cities are influenced largely by the fact that they must be ready for May 1 renting or else suffer vacancies for a considerable period. To meet this condition usually compels the starting of large operations about May 1, carrying on at a top speed through the summer and fall to enclose the building at the earliest possible date, and then the carrying on of all interior work during the winter months. This class of building provides work substantially over the entire year. Not much latitude is permitted in the starting of such operations unless other renting conditions prevail. Even under other rental conditions this class provides practically an all-year occupation, as it takes substantially a year to complete such structures if they are of any considerable size.

Theaters

Places of amusement which furnish much work are usually desired for completion in time for fall opening. These, therefore, depending on their size, must start either in early spring or the preceding fall and carry on right through the winter, so that this class, as well as office buildings, should normally provide a considerable amount of winter work.

Public Works and Utilities

Public works and utilities furnish a class of work which should not be influenced by seasonal activities and which should be used as a reservoir to draw upon, both in times of building depression and, if required during boom periods, should be carried on during the least busy months. This would surely benefit all parties concerned. The public owning the buildings or paying revenues for their support would profit by reduced building cost. Contractors and workmen would gain by being occupied during the winter months, and the building public would further profit by having that much less work thrown into the summer months.

Apartment Houses and Residences

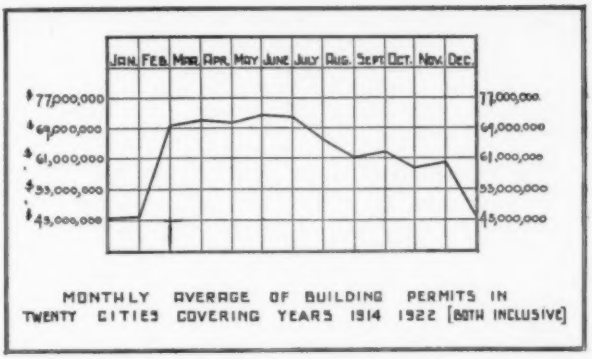
Apartment houses are to a large extent built by a class known as "speculative builders" on small margins of capital and must be turned out for completion just prior to the renting season. If May 1 is the most popular renting date, I believe starting in the fall and going on through the winter would be both possible and highly profitable. Where no fixed rental date exists, a campaign of education for winter building might be effective. Residences are very largely influenced by the mood of the builder, and I believe something could be done here to offset the popular prejudice against winter building.

In the past, industrial buildings were subject to the same influences as above mentioned, but within the past five years I have noticed a considerable change of attitude. With the rapid expansion of business, certain owners have decided to expand to meet the pressure, regardless of the time of year. Others having seasonal business of their own have been compelled to plan to move according to their business needs. Still others planning new buildings fitted to their requirements in order to reduce their operating costs, likewise seek in the face of high building costs to take advantage of every possible opportunity to keep down their investment. These classes, I believe, are rapidly growing, and the result, in my office at least, has been a steady increase of winter work. It is here that a large opportunity is afforded for education, showing the advantage of winter operations.

Education to Overcome Prejudice

To accomplish this, it is first necessary to overcome existing prejudices. These are mainly the established fear of damage, particularly in reinforced concrete buildings, resulting from cold, and the thought of decreased labor efficiency or increased cost resulting therefrom. That there is some ground for this assumption is understood. The developments and improvements in method of construction in recent years are not generally understood. For example, reinforced concrete buildings are probably more affected by cold than any other kind of construction, and yet they are being carried on more and more and without harm.

Contractors are familiar with the numerous methods by which materials are heated and by



MONTHLY AVERAGE OF BUILDING PERMITS IN TWENTY CITIES COVERING YEARS 1914 1922 [BOTH INCLUSIVE]

which the form work and reinforcing steel are cleared of ice and snow during the winter months. A feature of especial interest in the construction of several of our concrete buildings is the use of the form work for the floor above that which is being poured, as a protection over the concrete. By standing the 4 x 4 uprights on wedge-shaped concrete blocks which rest on the form of the slab to be poured, the forming for the next floor above can be practically completed.. In case of heavy snow or rain, tarpaulins laid over this form work give a water-tight protection, as well as enclosing the space for temporary heating. By these methods, and including the use of chemicals under certain conditions, building operations are facilitated so that, except under most severe conditions, work can be carried on without interruption. Although it is necessary to prepare, and to provide all necessary precautions, it frequently is the case that winter weather turns out to be mild and no difficulties whatever are encountered. In this case, provided the right kind of contract is entered into, both owners and contractors will gain thereby.

During the last winter, one heavy reinforced concrete structure ten stories in height, containing 16,000 square feet on each floor, through the efforts of an energetic contractor was carried up from the first floor to the roof in less than seventy total days, or sixty actual working days. The previous winter, another concrete building, containing 6,000 square feet per floor, was carried up twelve floors in one hundred total days. This included bad weather conditions, holidays, and some days when work was held back for the lower floor to set. Some floors were poured in five working days from the time of completing the previous floor.

The omission of the top finish and placing this after the building is enclosed and heated generally expedites work. When this is done, great care must be used to see that the finish adheres thoroughly. It requires considerable skill to absolutely assure adhesion, as frequently the variation of the amount of water contained and the exact time of evaporation play an important part.

It is hardly necessary to state here the various methods which can be employed to safeguard and amply protect foundations and masonry, and it might be profitable to conduct a campaign of education along these lines, so that the public will not look with fear upon winter construction. After a building is enclosed and protected from the elements, the setting of temporary radiators after the installation of the heating systen of course expedites the remainder of the work.

Labor More Plentiful in Winter

The inducement for the prospective builder, as we all know, lies in the fact that there is usually a better supply of labor during the winter months. This has been especially true during the last four years, when the large flood of building operations during the busiest period has created such a shortage of labor and material as to bring about an unhealthy condition for both contractor and owner.

The contractor who has figured on the established wage scale has too often found his men soldiering on the job and himself helpless in the situation. A command would only result in losing his help altogether and frequently compel him, in order to complete his work, to raise the wages or pay overtime as an inducement to obtain workers from other contractors, who, in turn, would suffer the same experience and would finally be compelled to bid against the first contractor for the return of their former mechanics. After a few experiences of this nature, the contractor would naturally endeavor to protect himself in future work, and the succeeding owner would be compelled to pay the penalty of this competition for labor.

A better distribution of work throughout the year would tend to decrease this tendency, and likewise costs. Another evil which might be eliminated arises from the fact that unemployment drives workers into other fields or climates, and many of them do not return, thereby creating a still further economic loss.

Consider Overhead

The continuous overhead of a contractor's organization is a considerable burden to him during dull seasons and is a corresponding inducement for him to reduce his margin of profit for continuous employment, which will result in a decided advantage to the owner who can be educated to the advantages of building during the winter period.

Special Contract for Winter Construction

I believe a general publicity campaign directed toward the architect would be beneficial. In order to obtain results, the cooperation of the architect or engineer is absolutely vital. If winter work is under consideration, the conditions to be encountered should be clearly anticipated. I believe it would be ad-

visable, where time is of importance, to state in advance that the contract should be based on actual working days. Otherwise the contractor will, or rather should, protect himself by ample allowance for bad weather. Thus the cost is increased, and if moderate weather prevails, the owner is likely to be the loser.

It is also necessary to definitely consider work as a winter job in the writing of specifications. In other words, if the contractor's attention is called to the fact that he must figure on thawing out frozen ground, on providing a certain amount of temporary heat, on temporary enclosures at door and wnidow openings, and, in general, on carrying on his work irrespective of weather conditions, he will then allow enough in his original bid to cover the cost of such work and will not either slow down or stop work or ask the owner for extras when cold weather sets in. In order to avoid any question at the completion of the work relative to the time element, it is well to specify exactly what weather conditions and temperature are necessary, so that a "working day" is clearly defined in advance.

Naturally there are some contractors better fitted than others, by virtue of both experience and necessary equipment, to carry on work during the winter months. We have found that a number of prospective builders hesitate to let contracts just before cold weather, because some friend or associate of theirs has gone through an unfortunate building experience, but by showing them that most difficulties can be avoided by selecting a contractor who knows how to meet these conditions, such prejudice can be overcome.

Where there is not a general contractor on the work, the contractor for the masonry and concrete work will expect and should receive the proper cooperation of the other trades, so that the building can be enclosed and heated as quickly as possible. With this in mind, the specifications covering glazing, temporary boiler connections or radiators, and the maintenance of the heating system should be plainly stated, in order to obtain the cooperation of all trades.

A general publicity campaign might be directed toward the public as well as the contractors. A chart showing clearly the fluctuations, as well as a statement showing all the facts clearly and indicating the advantages to be gained, would be valuable and in time should produce results. A thorough study of the situation by committees representing the various industries throughout the sections of the country affected, and the submitting of their report for discussion among the various local organizations, should bring a wider range of experience and knowledge of its practical application to the individual contractors. A campaign carrying a popular slogan, obtained possibly by the offering of prizes to the public, would tend to arouse a general interest in the subject. It should be pointed out clearly that in many cases owners will profit by proceeding with their work regardless of weather conditions, when they can make savings of interest as well as taxes on investments lying idle. It is surely safe to state conservatively that winter construction will cost an owner no more than summer work.

In all of these elements that enter into the general question of improving building conditions, a careful analysis of the situation by both architect and owner, and frequently consultation with an intelligent contractor, will produce savings in cost of construction and result in a completed enterprise instead of an abandoned enterprise. This process repeated many times will produce healthier, saner and more satisfactory conditions in the building industry.

ACKNOWLEDGMENT.—From a paper read before the Fifth Annual Meeting of the Associated General Contractors of America, Chicago, 1924.

Civic Pride Speeds Up Work

By William J. McNulty

FOR eleven years attempts have been made to build a dry dock and auxiliary repair plant at East St. John, New Brunswick. The Norton Griffiths Company, contractors from England, who have fulfilled large contracts for docks, railways, buildings, bridges, etc., in America, Africa and Great Britain, held the original contract, but financial conditions during the war compelled the company to cease operations. The contract was then awarded to the St. John Dry Dock and Shipbuilding Company, financed by United States, Canadian and British capital.

Arrangements were made for a formal opening of the new dock and plant on an appointed date. In making the date, however, it was found that more work had to be completed than was realized when the date was originally selected. As a postponement of the formal opening would mean the cancellation of a public half-holiday, a parade containing floats, and a grand ball, the company was in a quandary. It was then decided to appeal to the civic pride of the men employed on the operation to secure the completion of the work in time. Addresses were made to them by officials of the company, outlining the necessity of having the work ready for the formal opening on the date agreed upon.

It was this appeal alone that resulted in the contract's being ready for the formal opening by the Governor General of Canada on the day stipulated. One week prior to the opening it was considered absolutely out of the question that the work could be completed at the time announced. Civic pride caused the employees to forfeit the wages that would have come from extended employment. They worked so hard during the last week there was no necessity for deferring the ceremony.

Manufacturers ---- Distributors ---- Consumers

Published under the auspices of the Associated Equipment Distributors, Sixteenth Street Viaduct, Milwaukee, Wisconsin

Combination Catalog of Construction Machinery

THE Associated Equipment Distributors, composed of a number of the leading dealers in contractors' machinery, have been working with the manufacturers of such equipment on a loose-leaf catalog plan, which will prove of very definite value to contractors and engineers as a means of combining in one binder a large amount of valuable material relative to the various kinds of equipment and machinery used in contracting and engineering work. Under this plan a large number of the leading manufacturers are furnishing their local distributors with loose-leaf inserts giving in condensed form illustrations and data in regard to their products, so that the dealers will be in a position to send out to their customers and prospective customers a valuable catalog in loose-leaf form, containing a condensed summary of the principal types of equipment which contractors need in connection with all kinds of construction work.

Heretofore only a few of the larger distributors have been able to afford a general catalog, and the tremendous cost of compiling a representative reference work was very excessive because the rapid advances and improvements in labor-saving devices so alter or materially change the specifications, general appearance and efficiency of equipment in general that an expensively bound catalog soon became obsolete. The loose-leaf catalog was conceived by the Associated Equipment Distributors as the only logical solution to permit, by the division of expenses between the manufacturer and the distributor, a new complete issue to be printed every year.

Among the manufacturers who are cooperating with this plan are the following:

Acme Road Machinery Company
Adams Company, J. D.
Advance Car Mover Company
Aeroil Company
Aldrich Pump Company
American Floor Surfacing Machine Company
American Saw Mill Machinery Company
Archer Iron Works
Atlas Engineering Company
Baker Manufacturing Company
Barber-Greene Company
Barnes Mfg. Company
Bates Valve Bag Company
Best Tractor Company, C. L.
Blaw-Knox Company
Blystone Manufacturing Co.
Boston Lockport Block Company
Broderick & Bascom Rope Company
Buckeye Traction Ditcher Co.
Buffalo-Springfield Roller Company
Byers Machine Company
Carbic Manufacturing Company
Carroll Chain Company
Chain Belt Company
Champion Blower & Forge Company
C. H. & E. Manufacturing Company
Cincinnati Electric Tool Company
Cleveland Electric Tramrail Company
Climax Engineering Company
Clyde Iron Works
Domestic Engine & Pump Company
Dravo Equipment Company
Easton Car & Construction Company
Erie Steam Shovel Company
Fate-Root-Heath Company
French & Company, A. W.
Green Company, L. P.
Haiss Manufacturing Company, Geo.
Goulds Manufacturing Company
Handy Sack Baler Company
Hardsocg Wonder Drill Company
Hauck Manufacturing Company
Heltzel Steel Form & Iron Company
Hinman & Company, D. A.
Holt Manufacturing Company
Hotchkiss Road Form Company
Insley Manufacturing Company
Iowa Manufacturing Company
Jaeger Machine Company
Knickerbocker Company
Koppel Ind. Car & Equipment Company
Lakewood Engineering Company
Lansing Company
LaPlant Choate Manufacturing Company
Lawrence Pump & Engine Company
LeRoi Engine Company
Leschan & Sons Rope Co., A.
Lidgerwood Manufacturing Company
Littleford Brothers
Mackbee Company, E. R.
McKiernan-Terry Drill Company
Mead-Morrison Company
MacWhyte Company
M & M Clamp Company
Master Woodworkers Mfg. Company
Mockbee Company, C. M.
Mundy Hoisting Engine Company, J. S.
Milburn Company, Alex.
National Hoisting Engine Company
Northern Conveyor Company
Northwest Engineering Company
Novo Engine Company
Owen Bucket Company
Parsons Company
Pawling & Harnischfeger Company
Pulsometer Steam Pump Company
Roos Company, H. W.
Roos-Meyer-Hecht Company
Sasgen Derrick Company
Sauerman Brothers
Schramm, Inc.
Shaw-Enochs Tractor Company
Shepherd Electric Crane Company
Smith Company, Geo. F.
Smith Company, T. L.
Smith Engineering Company
Sterling Wheelbarrow Company
Stewart Manufacturing Company
Street Brothers Machine Works
Stroud & Company
Tarrant Mfg. Company

Taylor Chain Company, S. G.
Templeton, Kenly Company
Union Iron Works
Universal Road Machinery Company
Vulcan Iron Works
Watson Truck Corporation
Waukesha Company
Western Wheeled Scraper Co.
Whitcomb Company, Geo. W.
Wiard Plow Company
Williams Company, G. H.
Wood Shovel & Tool Company
Wyoming Shovel Works

In addition to the above-mentioned manufacturers, many others are giving the matter their favorable consideration. The issuance of these loose-leaf catalogs will facilitate quick reference on the different types of machinery with authentic information regarding each piece of equipment. The possibility of securing these facts, figures and pictures in handy form in one volume will prove a real time- and money-saver for the busy contractor or engineer, as he will have constantly at hand a complete view of many of the most important models of machinery and implements used in his business.

Among the well-known distributors of contractors' machinery who expect to distribute these catalogs to their customers are the following:

Austin Machinery Company, W. E., Atlanta, Ga.
Borchert-Ingersoll Company, St. Paul, Minn.
Brandeis Machinery & Supply Co., Louisville, Ky.
Brewster & Williams, Inc., Syracuse, N. Y.
Brown-Bevis Co., Inc., The, Los Angeles, Calif.
Bunting Hardware & Machinery Co., Kansas City, Mo.
Clyde Company, New Orleans, La.
Clyde Equipment Company, Portland, Ore.
Connelly Machinery Company, Billings, Mont.
Contractors Equipment Co., Inc., Detroit, Mich.
Curd Equipment Company, Geo. B., Cincinnati, O.
Fuchs Equipment Company, Omaha, Nebr.
Hale & Company, Wm. H., Minneapolis, Minn.
Hedge & Mattheis Co., Boston, Mass.
Hofius-Ferris Equipment Co., Spokane, Wash.
Hunter Machinery Company, Milwaukee, Wis.
Interstate Machinery & Supply Co., Omaha, Nebr.
Kuhlman & Company, W. A., Toledo, Ohio.
Louer Company, W. B., Chicago, Ill.
Meyer Company, Henry H., Baltimore, Md.
Minneapolis Equipment Co., Minneapolis, Minn.
Noble Company, K. B., Hartford, Conn.
Pattison Supply Company, W. M., The, Cleveland, Ohio
Seibert-Milburn Company, Columbus, Ohio
Smith Company, Geo. F., The, St. Louis, Mo.
Tractor & Machinery Sales Co., Inc., Richmond, Va.
Yancey Brothers, Atlanta, Ga.
Ziegler Company, Inc., Wm. H., Minneapolis, Minn.

Why Open Bids on Monday?

A Psychological Study of Contractors and Their Methods of Preparing Bids

NOT long ago in conversation a city engineer said, "It has been my experience over several years in this office that if we call for bids to be opened on Monday we get several more bids than if they are opened on Wednesday, Friday or any other day of the week." The question immediately arose: Is there a psycholcgical time to open bids on a piece of work, particularly street, road or sewer work? This engineer was positive there was. He maintained that the average contractor was too busy, if times were normal, during the week to put in a bid. If he was reminded of the work on Friday or Saturday he would be very apt to spend part of Sunday looking over the ground where the work was to be done. A few hours of figuring at home late Sunday afternoon or evening and he would have a bid to submit by Monday morning. If the bids were opened later in the week, the contractor took his time, did not look the work over or forgot about it until too late. Then the result would be too few bidders and bids too high. The work would be delayed or let at a higher figure than contemplated.

Is this engineer's contention right? Is there a psychological time to call for bids on public work? If there is, it is worth the serious consideration of engineers. The time for opening bids should be when the most contractors will put in an estimate.—*Pacific Builder and Engineer.*

The Engineer

* * * And in truth what the engineer most properly deals with is that which can be measured, weighed and numbered. * * *

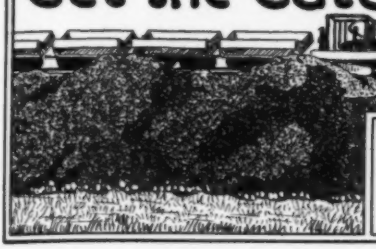
These are the certainties of the engineer; so far he finds a solid footing and clear views. But the province of formulas and constants is restricted. Even the mechanical engineer comes at last to an end of his figures, and must stand up, a practical man, face to face with the discrepancies of nature and the hiatuses of theory. After the machine is finished, and the steam turned on, the next is to drive it; and experience and an exquisite sympathy must teach him where a weight should be applied or a nut loosened.

With the civil engineer the obligation starts with the beginning. He is always the practical man. The rain, the winds and the waves, the complexity and the fitfulness of nature are always before him. He has to deal with the unpredictable, with those forces that "are subject to no calculation"; and still he must predict, still calculate them at his peril. His work is not yet in being and he must foresee its influence; how it shall deflect the tide, exaggerate the waves, dam back the rainwater or attract the thunderbolt. * * * Nay and more; he must not only consider that which is, but that which may be.—*Robert Louis Stevenson.*

Gases in Street Manholes

ATMOSPHERES in telephone manholes in Philadelphia have been examined for the presence of carbon monoxide by the Department of the Interior, acting through the Bureau of Mines. The Hoolamite detector and a newly devised bomb tester for explosive gases made of pipe fittings, spark plug, automobile spark coil and dry cells were used.

Get the Catalogs You Need



The catalogs and pamphlets listed below are available for free distribution. Contractors and Engineer's who check over these pages each month and write for such material as interests them, will find this a valuable means of keeping up-to-date on the subject of machinery and equipment.

A GOOD ROADS MANUAL

The Stockland Good Roads Manual, Second Edition, with its circular telling how to effectively use this book of descriptions and specifications of road machinery, should be in every contractor's hands. It may be secured from the Stockland Road Machinery Co., 3333 27th St., Minneapolis, Minn.

ROAD MACHINES AND DUMP-WAGONS

Gilbert road machines which can be operated day or night, rain or shine, and dump-wagons which are built for wear, are described in the illustrated literature of the Gilbert Mfg. Co., Aberdeen, S. Dak.

HOW TO BUILD ROADS THAT LAST

Contractors are interested in securing the right kind of material when bidding on a bituminous road job. The Barrett Co., 40 Rector St., New York City, will be pleased to furnish information regarding the use of Tarvia for all kinds of bituminous road construction, to any contractors interested in bidding on this type of work.

ENGINES FOR YOUR MIXERS

The Hercules Corp., Engine Div., Dept., B, Evansville Ind., will be pleased to furnish contractors a list of high-grade contracting machinery which is equipped with Hercules engines, insuring continuous, dependable service with low maintenance.

YOUR CHOICE IN MIXERS

The Ransome Concrete Machinery Co., 1772 Second St., Dunellen, N. J., claims that there is something in the design and operation of Ransome 28-S standard building mixers which justifies the confidence of large contractors, as they are purchasing them in quantities for use on some of the biggest engineering jobs under way to-day. Free literature will be sent on request.

A LOW-PRICE ONE-TON TRUCK

An all-steel body and weather-proof cab mounted on a Ford worm-drive chassis, giving a complete one-ton truck at a low price, is offered by the Sales Dept., Ford Motor Co., Detroit, Mich. Full information and prices may be secured from the company.

REVOLVING STEAM SHOVELS

The circulars of the Osgood Co., Marion, Ohio, tell why Osgood steam shovels are good. A postcard will bring full information regarding ¾-, 1-, and 1¼-yard revolving steam shovels, clam-shells, draglines and cranes.

WATER-METERS FOR ALL SERVICES

The Pittsburgh Meter Co., 7800 Susquehanna St., Pittsburgh, Pa., will be pleased to furnish to interested munipical officials and contractors complete information regarding its many types of water-meters for every class of service.

POWER DRAG SCRAPER OUTFITS

Power drag scraper outfits which are inexpensive and easily moved from place to place are a particularly good proposition for the owners of small gravel-pits, for county highway commissions and contractors, and are described in detail in the literature of Sauerman Bros., 464 S. Clinton St., Chicago, Ill.

DUMP-TRUCKS AND TURNTABLES

A circular recently issued by the Hug Co., Highland, Ill., describes the new Model TA 1½-ton Hug truck, the Model HA 1¾-ton truck, the Hug dump body and turntable.

ELECTRICALLY WELDED ROAD FABRIC

Clinton electrically welded fabric for reinforcing concrete roads, which is furnished in various sizes of wire and mesh in rolls or sheets, is described in detail in the literature of the Wickwire Spencer Corp., 41 E. 42nd St., New York City.

HIGH-GRADE PORTLAND CEMENT

Contractors interested in using a high grade of portland cement in construction work should secure prices and other information from the Pennsylvania Cement Co., 131 E. 46th St., New York City.

TROUBLELESS WATER-METERS

Catalog A-52 issued by the Union Water Meter Co., Worcester, Mass., describes King water-meters of the disc type, which are claimed to eliminate the trials of poor meters and have proved satisfactory in all installations.

BOTTOMLESS POWER DRAG SCRAPERS

Green bottomless power drag scrapers for excavating, digging and conveying with power instead of labor, are described in literature which may be secured from L. T. Green, 1234 Monadnock Block, Chicago, Ill.

CAST IRON PIPE

Descriptive literature may be secured from the United States Cast Iron Pipe & Foundry Co., Burlington, N. J., by contractors and officials interested in all types of cast iron pipe, fittings and castings.

SHOULD WATER BE STERILIZED?

The literature of Wallace & Tiernan Co., Inc., Newark, N. J., answers, in a very effective manner, the question as to whether drinking water should be sterilized.

ECONOMICAL EXPANSION JOINTS

Ideal expansion joints which are standardized preformed paving joints made of high-grade filler asphalt for the protection of concrete and block type pavements, are described in the literature and price lists of the Waring-Underwood Co., Commercial Trust Bldg., Philadelphia, Pa.

TRAILERS REDUCE HAULING COSTS

Contractors interested in an economical hauling proposition will be interested in the literature of Whitehead & Kales Co., Detroit, Mich., describing W. & K. trailers which are used very effectively with light-weight tractors.

HIGHWAY REINFORCEMENT

A reprint, "Recent Practice and Results in Highway Reinforcement," by H. Eltinge Breed, may be secured from the Truscon Steel Co., Youngstown, Ohio, free on request.

A TRUCK BUILT FOR SERVICE

The Federal Motor Truck Co., Detroit, Mich., claims that there is no motor truck built that will give more years of service at less cost than the Federal. Booklet S-10, "Making One Thing Better," describes the manufacture of the truck from start to finish and contains many interesting facts for contractors.

A FREE MANUAL ON GYPSUM TILE

The United States Gypsum Co., 205 W. Monroe St., Chicago, Ill., has issued a free manual on the use of gypsum partition and furring tile, which should be very helpful to contractors, architects and engineers, who can effectively use this material in wall and partition construction.

MODERN WIRE ROPE

The Williamsport Wire Rope Co., Williamsport, Pa., will be pleased to send its handsome Telfax color chart and a booklet on modern wire rope free on request. The booklet tells why every foot of Williamsport rope made since November has a patented Telfax tape running clear through the hemp core, plainly indicating each grade of wire rope.

HOISTS, DERRICKS AND CABLEWAYS

Street hoists, derricks and cableways, operated by steam, electricity and gasoline power, and built to stand up under the most severe service, are described in the literature of the Street Brothers Machine Works, Chattanooga, Tenn.

BOTTOM- AND REAR-DUMP WAGONS

The Acme Wagon Co., Emigsville, Pa., manufactures steel bottom-dump wagons as well as rear end-dump-wagons which are well-built and of particular interest to contractors having material to handle. These wagons are described in illustrated literature which may be secured free on request.

A ¾-YARD PORTABLE SCRAPER OUTFIT

In Circular 124, Sauerman Brothers, 438 S. Clinton St., Chicago, Ill., describe the new ¾-yard Sauerman portable scraper outfit, which is a welcome addition to the ¼- and ½-yard portable outfits that are so well known among contractors and county road officials for the handling of sand, gravel and crushed stone.

WIRE REINFORCING FABRIC IN BUILDINGS

The American Steel & Wire Co., 208 South La Salle St., Chicago, Ill., in its latest book, "Wire Reinforcing Fabric in Buildings," describes the uses of triangle-mesh fabric and electric-weld fabric, giving valuable tables, designs and comparative data for the use of architects, engineers and contractors.

DERRICKS AND CRANES

Catalog No. 22, issued by the Dobbie Foundry and Machine Co., Niagara Falls, N. Y., describes in detail steel and wood derricks and steel cranes of all types, operated by electricity, steam or gasoline or hand.

A 10-12-TON MACADAM ROLLER

The new Iroquois 10-12-ton macadam roller of the vertical boiler type is well described in the illustrated circular which the Barber Asphalt Co., Iroquois Sales Dept., Land Title Bldg., Philadelphia, Pa., will be pleased to send to any officials interested.

WATERPROOFING CONCRETE

The Security Cement and Lime Co., Hagerstown, Md., in its well-prepared literature describes the use of Cal as a waterproofing material for concrete, making the structure both impermeable and non-absorptive.

ELECTRIC HOISTS FOR CONTRACTORS AND BUILDERS

Catalog 9, issued by the Thomas Elevator Co., Hoyne Ave., and Monroe St., Chicago, Ill., gives complete information regarding Thomas two-speed steam and electric hoisting friction-driven boom swingers, double-cage power elevators and other high-grade hoisting equipment for contractors and builders.

FOUR-CYLINDER ENGINES FOR CONTRACTORS

Turmo four-cylinder engines, built to stand constant usage and fully equipped for the use of contractors, are described in an illustrated circular which may be secured from Turner & Moore Mfg. Co., 4660 Merritt Ave., Detroit, Mich.

COMPLETE DATA ON CONCRETE MIXERS

Catalog 409E which has just been issued by the T. L. Smith Co., Milwaukee, Wis., describes Smith concrete mixers from the ground up, shows what they can do on the job, and contains letters from contractors using them on all kinds of work.

A NEW EFFECTIVE DIGGING BUCKET

The Fogarty digging bucket, designed to excavate material that cannot be handled profitably with the ordinary type of clam-shell or orange-peel, is described in the literature of the Fogarty Excavating Appliances, Inc., 80 East Ave., Rochester, N. Y.

PRECAUTIONS IN CONCRETE BUILDING

In Bulletin 32, "What Would Your Answer Be?" the Pittsburgh Testing Laboratories, Pittsburgh, Pa., records some interesting questions and answers regarding the collapse of a concrete structure.

A NEW AIR COMPRESSOR OUTFIT

An air compressor outfit in cooperation with a Fordson tractor, giving a mobile unit, opens up new fields for the contractor's pneumatic equipment. Complete information regarding this unit may be secured from the Curtis Pneumatic Machinery Co., 1671 Kienlan Ave., St. Louis, Mo.

ROAD-BUILDING AND CONTRACTORS' MACHINERY

An interesting line of light-, medium- and heavy-weight road graders, levelers and two- and three-blade road drags, is described in the literature of the Oberlin Machinery Co., Oberlin, Ohio.

INDUSTRIAL TRACKS, CARS AND BATCH-BOXES

Road Bulletin No. 43, issued by the Koppel Industrial Car & Equipment Co., Koppel, Pa., describes Koppel equipment, including industrial track, cars and batch-boxes for the economical and speedy building of concrete roads.

A NEW ONE-MAN EXCAVATOR

The new Insley one-man-operated excavator has low first cost and maintenance charges. Catalog No. 46 issued by the Insley Manufacturing Co., Indianapolis, Ind., describes this machine in detail.

CALCIUM CHLORIDE SPEEDS UP CONCRETE WORK

Booklet 2053 issued by the Solvay Process Co., Wing & Evans, Inc., Sales Div., 40 Rector St., New York City, shows how calcium chloride added to the mixer water makes it possible to make concrete as strong in 48 hours as it usually is in seven days with plain water.

DUMP BODIES FOR ONE-TON TRUCKS

The "Crooke" all-service truck dump body for one-ton truck chassis is described in the literature of the New York Central Iron Works Co., Inc., Middleburg Road, Hagerstown, Md.

GASOLINE SHOVELS THAT LOAD THEMSELVES

Information regarding P & H gasoline shovels, which can easily load themselves onto flat cars without any dismantling whatsoever, will be found in literature which may be secured from the Excavating Machinery Div., Pawling & Harnischfeger Co., 3819 National Ave., Milwaukee, Wis.

FASTER MIXING OF ASPHALT

The latest literature of the Barber Asphalt Co., Land Title Bldg., Philadelphia, Pa., describes the new redesigned Iroquois three-unit portable asphalt mixing plant which is far exceeding in actual practice its guaranteed capacity of 1,250 square yards of 2-inch sheet asphalt topping a day.

CORRECT DETAILS IN MIXER CONSTRUCTION

The Koehring Co., Milwaukee, Wis., manufacturers of pavers, mixers, cranes, draglines, and gasoline shovels, will be pleased to send literature showing the details of construction of various machines and just why these details are important in producing a better heavy-duty machine.

TRACTORS FOR ROAD BUILDING AND MAINTENANCE

The service of gasoline tractors in road building and maintenance as well as for the operation of rock-crushing plants, is told in an interesting manner in the illustrated literature of the C. L. Best Tractor Co., San Leandro, Calif.

ECONOMY IN MOTOR TRUCKS

The GMC literature and catalog and booklet, "Seven Steps Ahead," tell of the complete dependability and lasting economy of GMC trucks and how they are used by contractors in all kinds of work. This booklet may be secured from General Motors Truck Co., Dept. 49, Pontiac, Mich.

5-TON AND 10-TON TRACTORS

The particular field of operation of these two sizes of tractors, complete descriptions of all parts as well as illustrations and letters showing the service which these tractors have rendered, are given in two bulletins recently issued by the Holt Mfg. Co., Peoria, Ill.

ELIMINATE EXPANSION TROUBLES

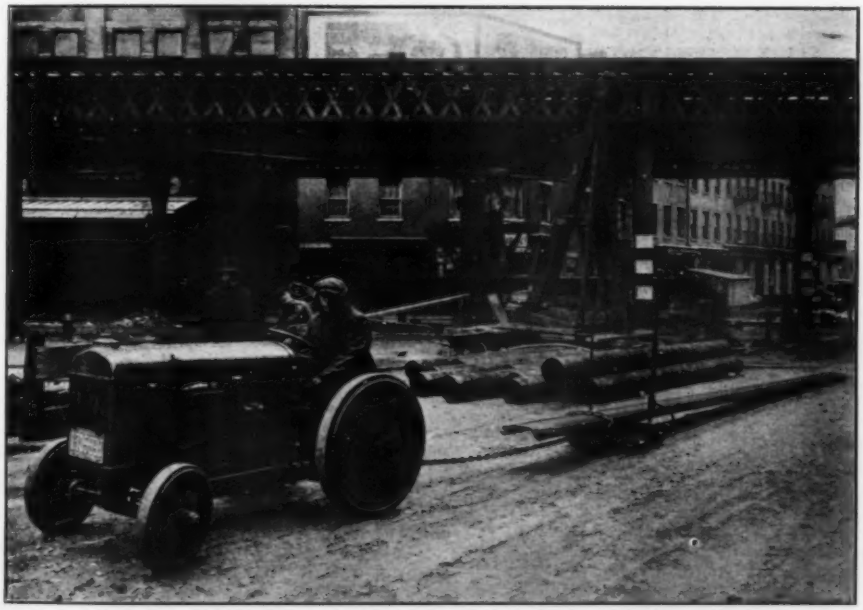
The Philip Carey Co., 9 Wayne Ave., Lockland, Cincinnati, Ohio, has just issued a new "Book on Elastite Expansion Joint" which it will be pleased to send to street and highway officials, contractors and engineers to enable them to have immediately at hand authoritative information gathered from reliable sources for use as a reference volume.

Contractors' Equipment in Service



A NO. 21 SMITH FULL-TRACTION PAVER USED BY THE BRIDGES ASPHALT PAVING COMPANY, ST. LOUIS, MO.

This paver is operated by a four-cylinder gasoline engine and was sold to the contractor by the George F. Smith Company, St. Louis, Mo.



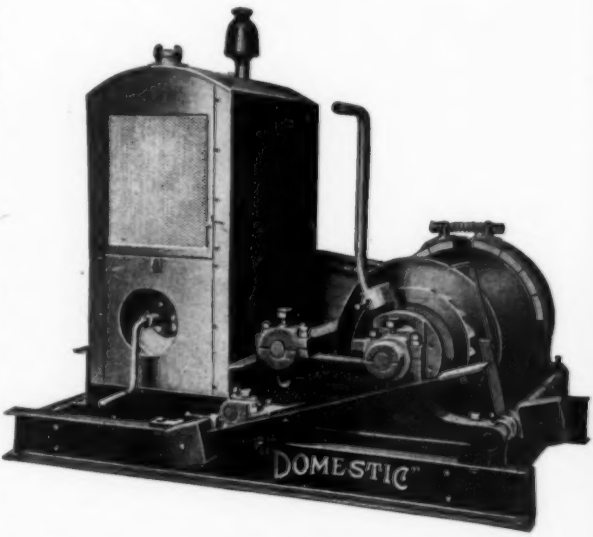
FORDSON TRACTOR AND SLED USED BY RODGERS AND HAGGERTY, CONTRACTORS FOR THE NEW YORK APPROACH OF THE NEW YORK-NEW JERSEY VEHICULAR TUNNEL

This tractor and sled have proved particularly helpful in hauling steel sheeting, timbers and pipe to the vicinity of Canal Street and Greenwich Street on the South Approach to the tunnel

Small Multiple-Cylinder, High-Speed Engines for Contractors

A Handy Unit for Small Hoists and Pumps

THERE is a growing demand for material elevator hoists, trench force pumps and diaphragm pumps equipped with small multiple-cylinder high-speed engines of the two-cylinder 5-8-horse-power type. The Domestic Engine & Pump Company, Shippensburg, Pa., has developed a 2-cylinder, 4-cycle, water-cooled, 5-8-horse-power engine for this type of work. The unit is completely enclosed in a metal housing and is equipped with a high-tension magneto, speed control governor, radiator and cooling fan, as well as reduction gears for the power take-off.



These engines are used on the Domestic material elevator hoists built expressly for use on building operations. The hoist will easily lift an elevator and handle a line load of 1,000 pounds at a hoisting speed of 125 to 188 feet per minute without any change in gearing. The hoist is built on a free-running drum, permitting a rapid lowering of the elevator even when empty, without wear or tear on the engine or gearing. Pawl and dogs hold the elevator at any desired elevation, and control of lowering is done with a band brake on the drum controlled by a foot lever. For single-cage elevators, a single-drum unit is used, and for two-cage elevators a double-drum unit.

The Domestic trench force pump, which is also equipped with the 5-8-horse-power engine, has a large capacity for handling dirty water in trenches, sewers, manholes, excavations, and coffer-dams and discharging it through pipe or hose line to a suitable place for disposal. This pump is of the plunger type and is double-acting.

The third unit equipped with the 5-8-horse-power unit is the Domestic double-diaphragm pump, which is used extensively in coffer-dam, sewer, ditch and trench work, where the seepage of the water exceeds the capacity of a single pump unit. This outfit has a capacity equal to a centrifugal pump of the same size suction, but does not lose its prime when air is drawn in the suction line from the bottom.

Improvements in Ditching-Machines

IMPROVEMENTS in the ditching machine made by the Barber-Greene Company, Aurora, Ill., are said to make the new model 44-A twice as effective as previous models. The basic design of the machine has not been changed, but the crawler has been lengthened 3 inches, the engine is mounted so as to better counterbalance the boom, the control and drive-shaft have been simplified, changes in digging speeds are now made by shifting gears as in an automobile, and the digging depth has been increased to 5½ feet.

The vertical boom with which all Barber-Greene ditchers were originally equipped has been retained. It has been made more efficient by a redesign of the bucket. The original bucket was self-cleaning, but the new type is deeper and the cleaning lip has been given a greater swing. Sides have been added to the bucket, and the projection of the teeth has been extended. Another feature is the interlocking arrangement of the bucket whereby in the digging position the buckets rest upon one another so that the digging pressure is distributed along the whole bucket line as in a column, preventing the bucket line from doub-

CATERPILLAR
Reg. U.S. Pat. Off.



Nine "Caterpillars"* for a fifty-three mile contract

After investigating fully the most practical and economical means for completing in the shortest time a 53-mile state road contract in Bureau, La Salle and Lee Counties, Illinois, the R. F. Conway Company of Chicago has just purchased a fleet of nine "Caterpillar" 10-ton Tractors for completely motorizing the operations. *Only proven performance records, factory service-to-owners, and absolute merit were considered.* The selection of "Caterpillars" for such an important contract by such an experienced contracting firm shows the value of the "Caterpillar" for every contracting and road-making operation. We invite correspondence from contractors, engineers and public officials. No matter what your power needs may be, there is a "Caterpillar" of size and capacity to meet every phase of road-making and dirt-moving work.

THE NATION'S ROADMAKER

**** There is but one "Caterpillar"—Holt builds it***

THE HOLT MANUFACTURING COMPANY, *Inc.*
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***Eastern Division:* 250 W. 54th St., New York**
Branches and service stations all over the world



THE NEW MODEL 44-A VERTICAL TRENCHING MACHINE IN ACTION

ling in. Complete protection against wreckage of the digging boom is given by the overload release sprocket, which does away with any friction clutch or breaking bolt safety devices. The sprocket prevents loss of time, as it slips when any overload is placed on the boom, turning immediately to operating position again and slipping again if the overload is still present. This action may be continued practically indefinitely until the stone, pipe, or other obstruction is dislodged or until the operator concludes that it is necessary to pass the boom over the obstruction and dig it out by hand.

The machine is equipped with a new crawler which is 3 inches longer and on which the weight of the machine is better distributed. This distribution has been obtained by mounting the motor just outside of the frame, instead of just inside as formerly. The crawler frame is of a one-piece steel casting. By mounting the motor outside, it has also been possible to eliminate one counter-shaft and thus simplify the transmission of power to the various parts. A 38-horse-power engine provides ample power for any digging by this machine in compacted gravel or clay.

A Quick-Acting Self-Dump Body for Light Trucks

HAVING built steel dump bodies for heavy trucks for quite a number of years, the Research and Engineering Department of the Stewart Iron Works Company, Cincinnati, Ohio, has developed a new automatic or gravity-dump body for Ford 1-ton trucks. The body as constructed is of steel with 1-cubic-yard capacity, and is dumped by a control lever from the driver's seat. The same lever returns the body to place. The driver does not have to leave the seat to dump the body or to return it to place. The tail-gate opens automatically when the body is dumped, and closes automatically as the body is returned.



DUMP BODY WITH TAIL-GATE SWINGING OPEN AS LOAD IS DUMPED



Excavating and Material Handling Problems Simplified

THE most difficult problem for solution in the excavating field has been that which refers to the mechanical handling of materials where the yardage to be moved has not warranted a relatively high investment in mechanical equipment.

The Insley Excavator is the Answer

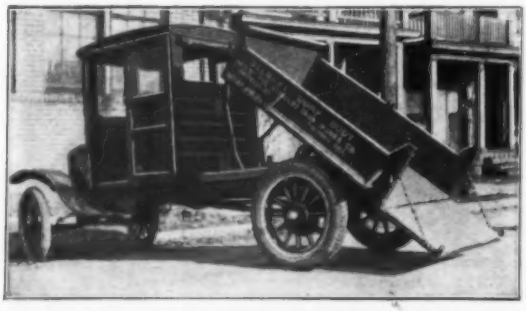
A one-man operated machine of low first and maintenance costs—it is just the unit you have been waiting for. Backed by the Insley reputation for the best by way of labor saving equipment, it warrants your investigation.

Write for Catalog No. 46

INSLEY MANUFACTURING COMPANY

Engineers. INDIANAPOLIS, INDIANA. *Manufacturers.*

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DUMP BODY IN FULL DUMPING POSITION WITH TAIL-GATE EXTENDED

The body is also furnished with mud-guards to protect the cab and body from splashing. The loading edge of the body when mounted on a Ford chassis is 47 inches from the ground with the body loaded, making it probably the lowest body on the market to-day.

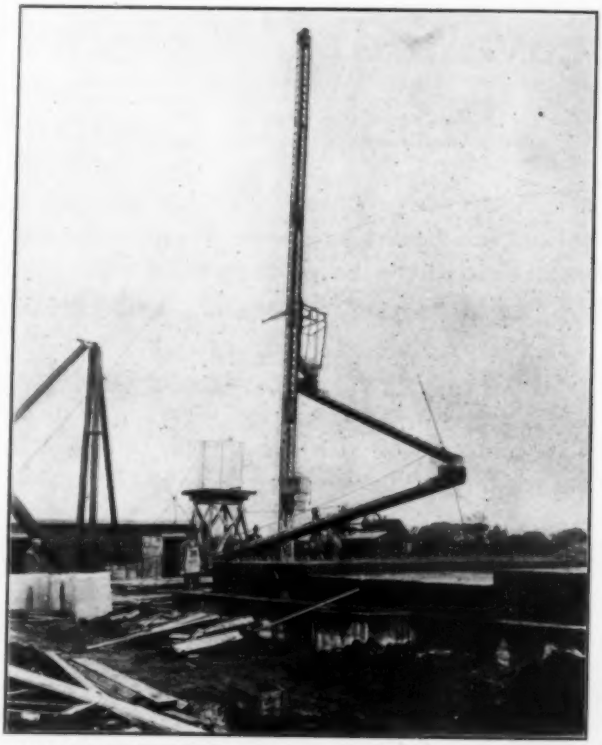
The tail-gate is double-acting, permitting the body to be used for any purpose, making it suitable for road building, general municipal service, contracting and other work. The dumping angle for the steel body, made of one piece of No. 2 gage sheet steel, is 45 degrees.

Complete Construction Equipment on Small Jobs

The Churchill Construction Company Shows Itself a Live Organization in Building Mausoleums

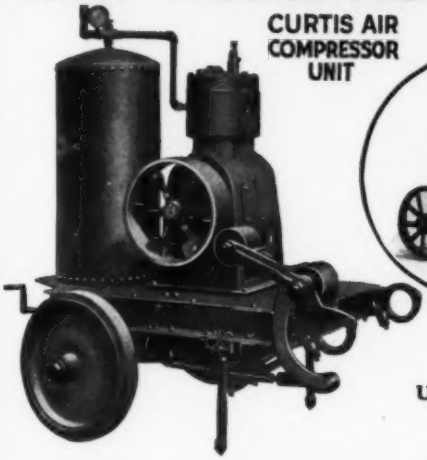
HOW many times have you heard a contractor say, "That's only a small job. We'll have to do every bit of it by hand, in spite of the fact that labor is scarce"? The Churchill Construction Company, Bushnell, Ill., of which Robert H. Churchill is Manager, did not feel this way when it undertook the construction of a moderate-size mausoleum in Yates City, Ill. After laying out the job and sizing it up carefully, they installed an Insley steel mast hoist plant for handling the concrete produced by a 7-S Smith mixer. For handling the stone work, a Sasgen derrick was put on the job. With this carefully chosen, reliable equipment the job showed a good profit.

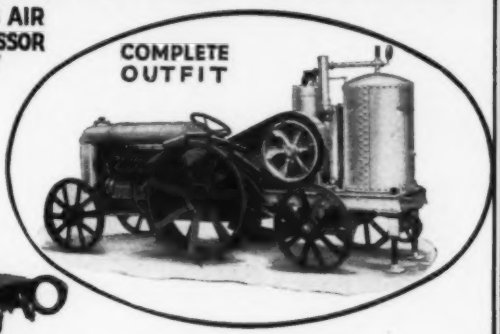
It is seldom that equipment of this kind is used on work of this nature, but many contractors may pattern their future small jobs along these lines and continuously make use of labor- and time-saving equipment. The equipment for this job was purchased by the Churchill Construction Company from the George F. Smith Company, St. Louis, Mo., distributors of contractors' equipment.



A SCENE ON THE CHURCHILL JOB SHOWING THE EFFECTIVE USE OF LABOR-SAVING EQUIPMENT ON A SMALL JOB

CURTIS-FORDSON AIR COMPRESSOR OUTFIT





Sold as Complete Outfit or Unit Can be Bought Separately

Fills A Much Needed Want

Here is just the thing contractors are waiting for—a portable air compressor unit that operates with any Fordson Tractor, making a complete self-contained outfit. Can be used on a hundred different kinds of jobs where a supply of compressed air is temporarily needed. An outfit that can be moved from job to job quickly by its own automotive power—no extra truck for pulling necessary.

50% More Service

The average contractor can easily get 50% more service out of the Curtis Fordson Compressor Outfit than from the ordinary portable compressor outfit, which is heavy, cumbersome, expensive and serves only a single purpose. It must be remembered that the Curtis Fordson has every quality of the ordinary portable compressor outfit plus the advantages of detaching the Fordson Tractor and using it for all tractor purposes.

Wide Range of Uses

The flexibility of the Curtis Fordson Air Compressor Outfit is remarkable—ideal for the road contractor, structural steel field jobs, oil field work, telephone construction, well drilling, etc. Just the thing to supply air for jack hammer drills, paving breakers, riveting hammers, rammers and tampers, compressed air hoists, sand blasts, stone cutting tools, quarry tools, rivet forgers, clay and coal mining diggers, for pumping water, for washing autos and trucks, unloading tank cars, paint spraying, caulking pipe lines, etc. For city streets can be equipped with rubber tires.

Tractor Used Independently

When the Curtis Fordson is not being used as a compressed air outfit, the Fordson Tractor can be detached and used independently for hauling, loading, moving or power-driving purposes. The coupling is simple—nothing to get out of order or misfit. The whole arrangement is sturdy and practical—the Air Compressor Unit can be attached or detached by anyone in a few moments.

If You Now Have a Fordson

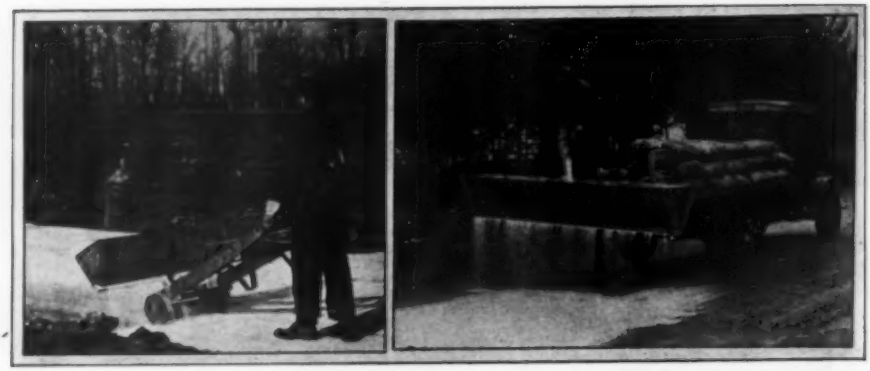
The Curtis Air Compressor Unit can be purchased separately. Used in connection with a Fordson, it opens new fields of work for the tractor and an additional source of revenue for you. You know the reliability of the Fordson—and you know the reputation and dependability of Curtis Air Compressors. The Curtis Unit is backed by 70 years' manufacturing experience, 27 of which have been devoted to the manufacture of pneumatic machinery, and our $1,500,000.00 institution. So you take no chances whatever.

Reasonable in Cost

The Curtis Fordson Air Compressor Outfit can be purchased complete, tractor and all, from us, or the Curtis Compressor Unit can be had separately. Mail coupon for full particulars and prices.

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Gentlemen: Please send me full information, your proposition and prices on:
☐ Curtis Fordson Air Compressor Outfit Complete
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HAND AND TRUCK METHODS OF DISTRIBUTING CALCIUM CHLORIDE FOR CURING CONCRETE ROADS AND DUST-LAYING, RESPECTIVELY

Spreading Calcium Chloride

THE application of calcium chloride to roads as a dust palliative is increasing yearly. This material is also used with great effectiveness for curing concrete roads. The Dow Chemical Company, Midland, Mich., has developed a spreading device, made primarily for distributing Dowflake, the product of the Dow Chemical Company, which can be used effectively for both kinds of work.

The spreader for application to roads to keep down dust is particularly simple and can be easily attached to any truck. It consists of a V-shaped hopper with an adjustable slot at the bottom, which is attached to the rear of the truck and into which one man can pour the calcium chloride flakes with sufficient rapidity to keep the flow constant. The other spreader is a similar, although smaller, device which can be carried on an ordinary wide-wheeled baggage truck and is used to apply the calcium chloride to concrete roads as soon as it is possible to run on concrete after it has obtained its initial set. The one-man hopper holds from 100 to 200 pounds of Dowflake, and one man with the machine can spread in an hour a sufficient amount of calcium chloride to cure all the concrete that the mixer can lay in a day.

The Economical Repair of Cutting Edges of Contractors' Equipment

IT is only natural that blades of graders and of scrapers wear out through continuous use. Instead of letting the softer metal above the cutting edge wear away quickly and cause the outfit to be scrapped before it has given every bit of service it should, contractors should consider renewing the cutting edges.

The Shunk Manufacturing Company, Bucyrus, Ohio, furnishes Economy repair blades for scraper bowls. Since the blade is made of high-grade plow steel, it will wear much better than the bowl, and when riveted to the bowl it makes the latter as rigid as when new. The repair cutting edges can be attached by any blacksmith by simply cutting the edge of the bowl square, drilling holes to match those of the blade, and riveting it to the bowl. The blades are made of steel 3/16-inch thick and 6 inches wide, giving a new cutting edge 3 inches wide and allowing 3 inches to lap top and bottom where it is riveted to the bowl.

This company also furnishes mold boards and edges for snow-plows as well as for graders if supplied with specifications or patterns. The Shunk Manufacturing Company has been making scraper blades for over 30 years and guarantees the material to be of the very best quality, but it does not replace blades that are broken or bent by such misuse as coming in contact with a solid obstruction.

This company was one of the first to furnish repair blades for the various road machines. In making the blades a steel of special analysis, which has been developed especially by the Shunk Company, is used. They carry a large stock of both raw stock and finished blades.

KEEP ROADS UP AND TAXES DOWN WITH
DOWFLAKE
CALCIUM CHLORIDE

Cures Concrete Pavements Better---Quicker---Cheaper

With the old method five men are required full time to cover pavement with earth. But with *Dowflake* one man can cure the same pavement with two hours' work by spreading *Dowflake* with a small spreader.

Three men are required full time by the old method to keep the surface wet and even then, continuous inspection is necessary to maintain uniform covering of earth and approximate uniformity of moisture. With *Dowflake* no wetting or other work is necessary.

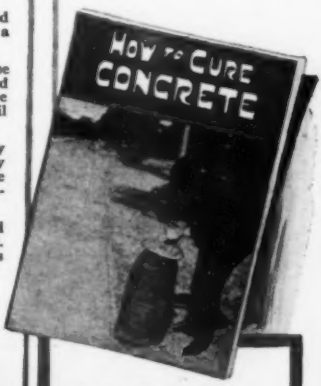
The old method of ponding or covering with earth or straw required considerable labor for removal of such material. *Dowflake* leaves a clean pavement, the material being absorbed.

The old method often meant a full crew loafing at the mixer because the inspector required all water for curing. With *Dowflake* you need never worry about this waste, because *Dowflake* absorbs moisture from the air, holds it in intimate contact with the concrete until curing is completed.

States that have standardized on curing Concrete with *Dowflake* say that the pavement *is* cured in shorter time and there is no worry on the part of the inspector. *Dowflake* has stood government, state and county tests. It is approved by leading engineers and contractors. It saves a lot of time and money.

Illinois has the most pretentious paving schedule of all states and is curing more pavement with *Dowflake* than by any other method. Descriptive literature on concrete curing and road maintenance is available on your request. Use the coupon.

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The Dow Chemical Company
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Send me the following—
☐ Book on "How to Cure Concrete."
☐ Book on "How to Maintain Roads."
☐ Folder on "How to Control Dust."
Also quote on Dowflake as follows—
To Cure.....yards concrete pavement.
To Dustproof ....miles..... wide gravel road
Name.....
Street.....
Town.....
State.....
Position.....

A Light-Weight Steam Tractor

Recent Development in Tractor Field Produces Interesting Machine

YEARS ago, when huge steam traction engines pulled the first plows through the virgin sod of the great Northwest, it was prophesied that some day a light-weight steam tractor would be built. The Bryan Harvester Company, Peru, Ind., has developed a light steam tractor of the condensing type.

The steam generator of this tractor is of the water-tube type and has no crown sheet or staybolts. The tubes, which are flexible, are easily removed and replaced quickly without affecting any other tube. The flexibility of the tube takes care of the expansion and contraction caused by the heating and cooling of the boiler. Rapid circulation of water in the steam generator means rapid steaming. Tests of the Bryan steam generator show that it is particularly efficient and produces more steam per gallon of fuel than most stationary steaming devices.

The steam engine has only thirteen slow-moving wearing parts and is positively lubricated throughout. The engine is of the two-cylinder, double-acting simple type, with balanced piston-valves with a bore of 4 inches and a 5-inch stroke. The valve gear is of the Stephenson link type. With the tractor running at its given speed for ordinary tractor work, the engine turns over 220 revolutions per minute. With positive force-feed lubrication in the engine cylinders and the remainder of the engine operating in an oil bath, the engine wear is reduced to a minimum. The engine is entirely dirt- and dust-proof and does not require constant overhauling, as there are no delicate adjustments necessary and the rapid circulation of water in the steam generator prevents the liming-up of the tubes.

The simplicity of the machine can be understood from a brief description of the travel of the water through the machine in the production of steam. At the front of the machine is a condenser, back of which is the steam generator, then the engine and rear axle. Everything is accessible; it is only a few minutes' work to get at the steam generator. The side plates are easily and quickly taken off. The travel of the water and steam in the tractor is started by the pumps which carry water from the tank to the generator. Steam is directed through the throttle, superheater and governor and thence to the engine. Its force expanded there, the steam exhausts into the condenser, where it is returned to a liquid state and piped back to the water-tank, reducing losses to a minimum and conserving heat.

The fuel-burning system in the Bryan tractor is of the vaporizing type, insuring complete combustion of all grades of kerosene or distillate, and resulting in fuel economy. Vaporization of fuel is secured by vaporizing-coils, located above the burner, into which raw kerosene or distillate is forced under air pressure. The gases thus produced are directed to the burner and distributed properly with an air mixture.



A LIGHT STEAM TRACTOR HANDLING LOADED WHEELED SCRAPERS ON GRADING JOB

Build Your Bridges Right

The bridge is an integral part of the highway. It must be capable of carrying the loads to which it may be subjected; it should restrict traffic as little as possible; its floor should have as good riding qualities as any other portion of the highway; it must afford safety to traffic and must itself be protected from accident.—E. F. Kelley, Senior Highway Bridge Engineer, U. S. Bureau of Public Roads.

KOEHRING



SO SMALL A THING AS A DRUM ROLLER

LOOKS like a small detail of mixer construction. But think of the weight a roller carries, the miles it travels! First of all rollers must be of liberal size, and since all carry the same weight, rollers ought to be equal in size. Because the materials are constantly shifting from end to end of the drum, the rollers must be spaced wide apart, each set near the end of the drum, otherwise the "rocking" action of the drum means unequal beveling wear on rollers, runways and bearings.

Koehring heavy duty construction meets these requirements of good design. In addition, the rollers themselves are carefully engineered and constructed. Cut with solid web with extra large hubs! Ground to accurate fit with runways! Chilled to resist frictional wear! Inside edges beveled to meet corresponding face on runway, taking end thrust and doing away with shearing wear between roller and runway when mixer is operating on an incline —and then the rollers are *fixed to the shafts which turn in big bearing*—The *only* heavy duty *type* of drum roller-bearing construction.

The more you know about the details of the Koehring, the surer you know that Koehring heavy duty construction is a ***value***, not a mere phase.

CAPACITIES

Pavers—7, 10, 14, 21, 34 cubic feet mixed concrete. Steam, gasoline or electric power. Can be mounted either on regular steel rim wheels or solid rubber tires, half length multiplane or full length multiplane. Boom and bucket or spout distribution. Derrick arrangement—double derrick on 21E and auxiliary water tank on 21E and 32E if desired.

Construction Mixer—10, 14, 21, 28 cubic feet mixed concrete. Steam, gasoline or electric power. Mounted on trucks or skids. Rubber tires optional. trucks or skids. Ruboer tires optional. Equipped with power charging skip.

Dandie—4 and 7 cubic feet mixed concrete. Gasoline engine on and 107S.

KOEHRING COMPANY, MILWAUKEE, WIS.

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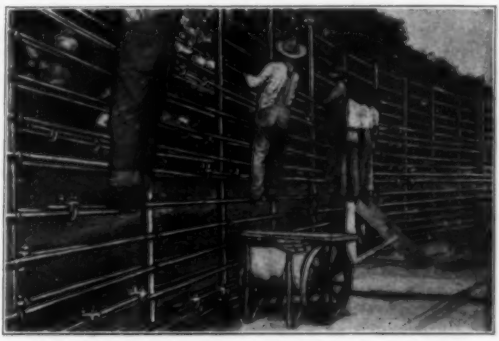
Section of Drum Roller

Construction Methods on Reservoir at Winchester, Va.

Three-Million-Gallon Circular Concrete Reservoir Built in Summer of 1923

WINCHESTER, VA, is a thriving city of 7,500 people, in a famous apple country, and has important woolen and knitting mills. Last summer it built a 3,000,000-gallon concrete reservoir, which is a circular structure of heavily reinforced concrete, 212 feet in diameter. The reinforcing is of the continuous circular type, each course of bars being lapped and spliced together with two Crosby clips, making it in effect a solid steel hoop.

This circumferential reinforcement was tied on steel channel risers, 18 steel bars being wired in pairs on each side of the channel upright. Two holes were bored in each channel for each course of bars, and the bars wired securely to the channel with No. 12 wire. Six days were consumed in placing the reinforcing. Two days were required to set the channel uprights, and four more to place the circumferential bars and clips.



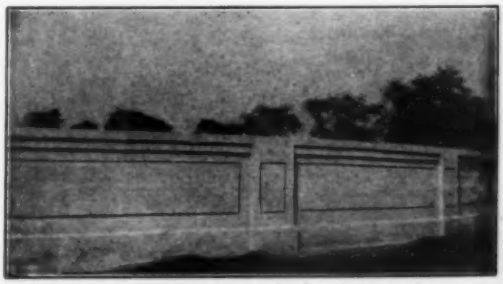
PLACING THE REINFORCING STEEL—USING CROSBY CLIPS FOR SPLICING THE BARS



MIXING PLANT AND A VIEW OF THE FORMS AND REINFORCING

Several sizes of bars were used in the structural reinforcing. Eight 1¼-inch bars were used at the bottom, four 1-inch bars half-way up the wall, and six ¾-inch bars at the top. The 1¼-inch bars were spaced 6 inches apart, the 1-inch bars 8 inches apart, and the ¾-inch bars 10 inches apart. A bar lap of 40 diameters was allowed at the splices. While this is not necessary with clips such as were used on this job, properly applied, many designing engineers seem to cling to it. Exhaustive tests made of a short lap, spliced with two Crosby clips, butted close together, one turned one way and one the other, show that they will develop the entire efficiency of the splice. Furthermore, this is more economical than the longer type of lap, the saving in steel effected by reducing the lap going far toward paying for the clips. In the Winchester reservoir, the clips used to splice the laps were placed from 6 to 8 inches from the end of the bar splices. Two clips were used at each splice.

The walls are 18 inches thick at the



THE WINCHESTER RESERVOIR IS ATTRACTIVE ARCHITECTURALLY



For Heating and Applying under Pressure all varieties of Bituminous Materials, Hot or Cold, for Road Construction, Maintenance of Dust Laying.

Heat and volume under instant control of operator. Positive pressure produced by the Kinney Pump.

Auto Heater and Distributor PATENT COMBINATION

QUALITY Kinney EFFICIENCY

HANDY HEATER and SPRAYER

Especially adapted for Road maintenance, construction and general repair work. Contents constantly agitated while heating.

No burning or coking of materials, Pump, Piping, Hose, Nozzles, AutomaticallyHeated.

No Steam Required.



Kinney Manufacturing Company

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BOSTON, MASSACHUSETTS

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bottom, tapering to 12 inches at the top. The wall footings are 4 feet wide and 15 inches deep. The footing reinforcement consists of two ½-inch bars running around the footing, with cross-pieces of ½-inch bars spaced 12 inches on centers. The walls rise 9 feet above the surface of the ground and extend 3 feet below the surface.

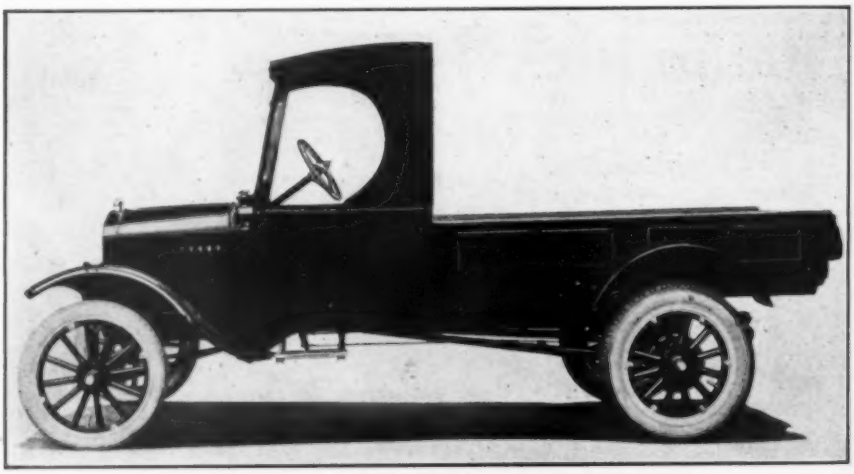
A 1:2:4 mix concrete was used, poured from buggies. A total of 1,350 cubic yards of concrete was used in the entire structure. The actual pouring of the concrete took about 30 days. The floor was divided into 39 slabs, with a 6 x 12-inch footing around the outer edge of each slab. The labor crew when working on the floor consisted of 12 men. Six more men were added when work on the walls was begun.

The Winchester reservoir is attractive architecturally, the monotony of the blank wall being relieved by 24 pilasters which extend 6 inches out from the main wall, and a molded cornice around the top. Wooden forms were used for the outside of the walls, and metal ones inside. The water stored in the reservoir is obtained from a large spring on the east side of the city and is treated with chlorine before being turned into the city mains. The pumping equipment consists of two steam pumps and two electric pumps. This reservoir was built by Strickler and Wagner, a well-known Southern contracting firm established in 1907. The Crosby clips used on the job are made by the American Hoist and Derrick Company, St. Paul, Minn., and were purchased through the Snapp Foundry, Winchester, Va.

One-Ton Trucks with Steel Cab and Body

Latest Development in Unit Construction of Light Trucks

AN all-steel combination truck body and cab mounted on the standard Ford one-ton chassis, which will be sold as a complete unit, has recently been announced by the Ford Motor Company, Detroit, Mich. The new body is of the open express type, so constructed that it may be readily converted into other body combinations by using stakes, side-boards, a canopy top, or screen sides. The purpose of producing this body, according to the Ford Motor Company, was to place a low-cost, general-utility truck, meeting with both agricultural and commercial requirements, at the disposal of the users of one-ton trucks. The body is built of steel to withstand severe use, and presents a new development in construction. The steel sills are reinforced with wood in order to lessen vibration and road shocks, thus making for more durability and longer life. The loading space is 7 feet 2 inches in length by 4 feet in width, and of convenient and practical depth. The end gate is strongly braced and secured by heavy chains, which hold it in position when lowered.



AN INEXPENSIVE PIECE OF EQUIPMENT FOR CONTRACTORS

The cab, also of steel construction, is extra roomy. The seat is of artificial leather, well-cushioned, on 4-inch springs. Protection from the weather is afforded by close-fitting door curtains mounted on uprights and opening and closing with the door. An oblong window in the back of the cab gives ample facilities for rear vision.



Section of Central Highway's 110 miles of TEXACO ASPHALT Paving now being increased to 121½ miles.

TEXACO ASPHALT PAVING

a quality told in mileage

In North Carolina, TEXACO ASPHALT Paving presents for the consideration of contractors another proof of its standing among highway engineers.

That is, that the Central Highway, main trunk route of the State system, is

Paved with TEXACO for 110 miles

But that is not all. Wayne County, N. C., is about to add to this already unusual figure another 11½ miles, which will mean

121½ Miles of TEXACO on a single highway

A paving material that has the confidence of engineers to the extent evidenced in North Carolina cannot be overlooked by paving contractors.

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A Handy Portable Conveyor

A New 22-Foot Conveyor Makes Bid for Contractors' Interest

A NEW machine which has been designed to meet the demand for a portable, moderate-priced conveyor, and one which combines lightness in weight with compactness, durability and strength, has been placed on the market by the Atlas Engineering Company, Milwaukee, Wis. This conveyor is known as the Red-Head, as an upper section is painted a bright red, the rest of the machine being finished in black. All parts of the conveyor are of steel construction. The low receiving or charging end makes it possible to crowd the machine into the pile, enabling the shovelers to load easily and more rapidly.



PORTABLE CONVEYOR A HANDY PIECE OF CONTRACTING EQUIPMENT

The truck tower furnished with this machine is of the same type and construction as that furnished with all Atlas portable belt conveyors, but without the swivel axle feature. A simple raising and lowering device enables the operator to adjust the conveyor to any loading height. To rollers are equipped with cone-shaped ends, which have a tendency to dish the belt, keeping the material away from the sides and forcing it into the center. This feature, together with the high conveyor sides, avoids spillage. The conveyor belt is regularly equipped with carrying cleats. Both the head and the foot pulleys are machine-crowned, which has a tendency to force the belt to run true at all times.

The machine is furnished with either electric motor or gasoline engine, and also at a slight additional cost a housing can be secured to protect the power-plant against being tampered with when the machine is not in operation. When the machine is equipped with an electric motor, a safety switch is furnished, while on the gasoline-engine-equipped conveyor, magneto ignition is standard equipment.

When the conveyor is equipped with a gasoline engine, a clutch is furnished on the jackshaft within easy reach of the operator, making it possible to start the engine independently of the conveyor. A starting table or platform is regular equipment on gasoline-engine-driven machines. By standing on this table, the operator can very easily start and stop the engine as well as make any necessary adjustments.

The conveyor is 22 feet long, with a 16-inch rubber carrier belt, giving the machine a capacity of from 20 to 40 tons of heavy material per hour.

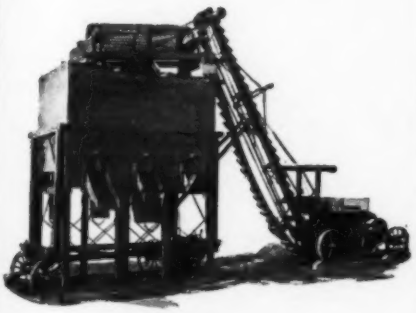
Highway Construction

Total Expenditure of $1,000,000,000 in 1923 Will Be Equaled in 1924

DURING each of the years 1921 and 1922 the total expenditures for all highway purposes, such as construction, maintenance and up-keep, including interest on borrowed money and miscellaneous items for all our public roads located outside the limits of incorporated towns and cities, according to Government figures, amounted to approximately $1,000,000,000. Such data as are now available indicate that the expenditures for the year 1923 varied but little from this amount, and that in 1924 they will not vary materially from this sum. The work directly controlled by the states will probably continue to increase, as has been the case during recent years. The local work controlled by the counties, townships and districts may decrease somewhat on account of the agitation against bonds and highway taxes, but it is thought improbable that the decrease will be large.

The ever increasing number of motor vehicles is constantly demanding more and better roads as well as better maintenance of existing roads. The motor vehicle is also directly and indirectly supplying more and more funds for highway work. The normal expectancy in regard to expenditures for our public roads would therefore seem to be that they will increase from year to year at least until the highway systems become sufficiently developed to fully meet the needs of this traffic.

—*Bulletin*, National City Bank of New York.



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Unlike those in all other jaw crushers, which are only actually crushing 50% of the time, the jaws in the Western-Aurora Crusher are never idle. While the top half opens to grasp new stone, the bottom half closes, and vice versa. Yet there is no dead center.

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The Austin Western Road Machinery Co.

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Put a Train of Maneys on the Job



Turn the Train— In a Road's Width

It doesn't take a 5-acre field to turn the Maney train—these scrapers track perfectly and follow the tractor without "skidding" or turning over.

Move More Dirt--- Less Cost

That's what every dirt mover seeks. Wise road contractors figure on a train of Maneys to make the contract pay profits.

The new Maney 1¼-yard Model "D" is larger capacity and stronger built—just the thing for heavy work behind large tractors.

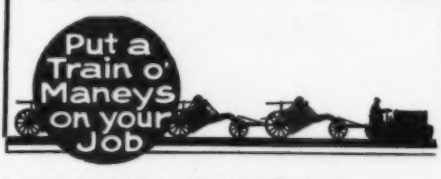
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Capacities:
1½ to 7½ tons.
Tractors
to 15 tons.

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Our engineering department is well prepared and always glad to analyze special problems of motorized equipment and will submit an unbiased recommendation, with no obligation to you.

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Branches owned by this company operate under the titles of: "MACK MOTOR TRUCK COMPANY" and "MACK-INTERNATIONAL MOTOR TRUCK CORPORATION."

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HUBER ROAD TOOLS
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The Huber Four Cylinder Gasoline Roller starts easily, has surplus power and convenient to handle. Air controlled scarifier folds under when not in use.

The Huber Steam Roller has been standard equipment with road builders for many years. Always dependable. The Huber One-Man Road Maintainer is economical and the four cylinders furnish excess power. Has weight enough to hold blade down when making heavy cut and pulls a detached grader when necessary.

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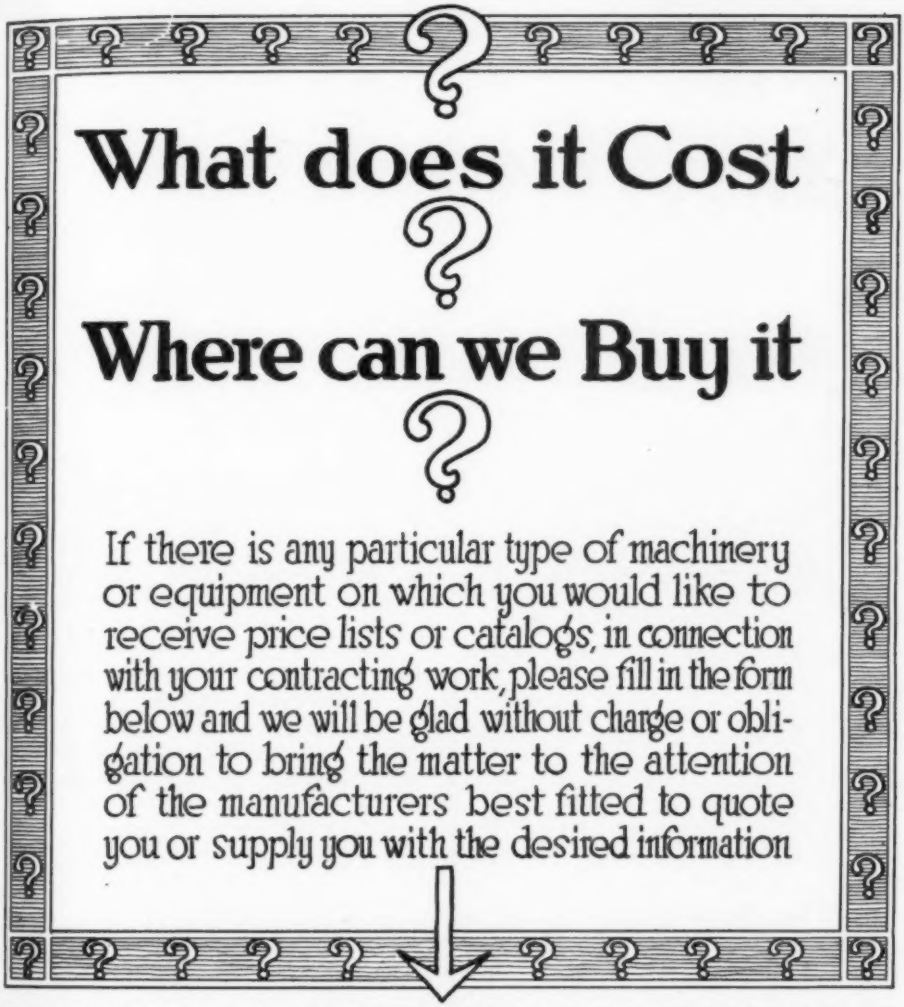
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443 Fourth Avenue, New York City

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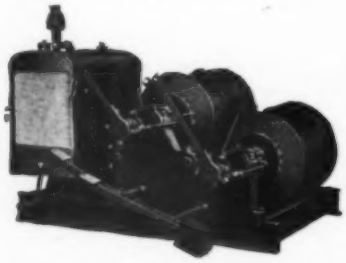
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On light-duty hoisting there's nothing can equal this up-to-date, free-running outfit. Its compactness, simplicity, economy and ease of operation, coupled with absolute dependability, makes an indispensable proposition for this class of work.

Use them for operating your material elevators, hoisting concrete buckets in connection with your chute placing systems, for all your light pile driving, general hoisting, etc.

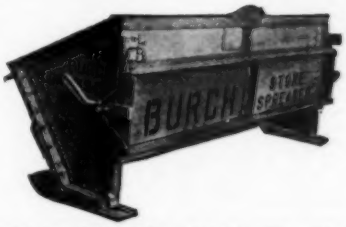
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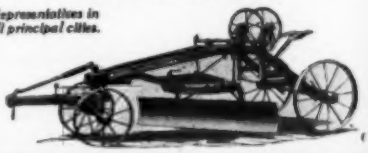
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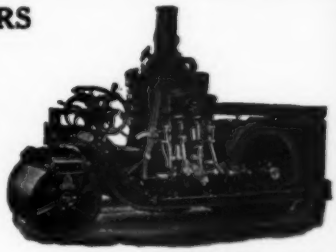
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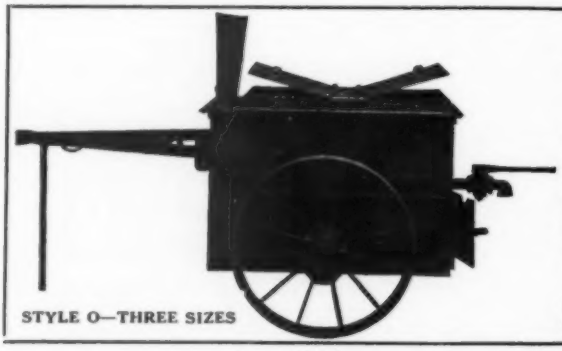
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It is as thorough as we can make it. It is the last word on the use of expansion joint in concrete construction.

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Carey Elastite

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PROVED AND ACCEPTED EXPANSION JOINT



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Elastite Expansion Joint is an elastic resilient material composed of two sheets of asphalt-saturated felt between which is "sandwiched" a body of carefully refined asphaltic compound.

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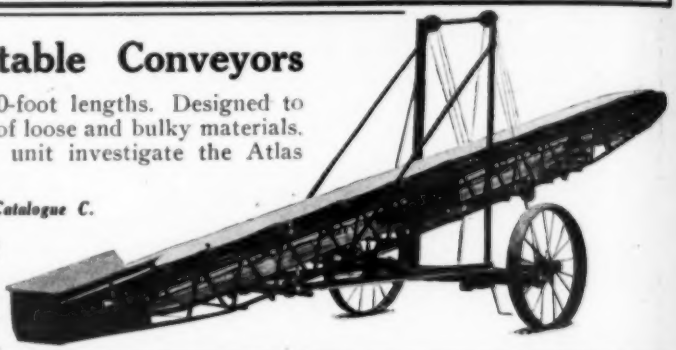
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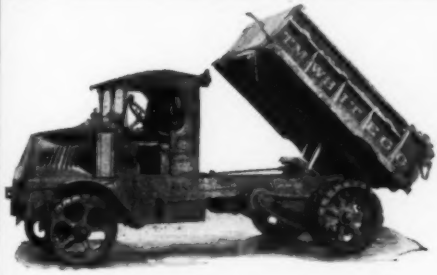
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CONTRACTORS' & ENGINEERS' MONTHLY

443 FOURTH AVENUE NEW YORK



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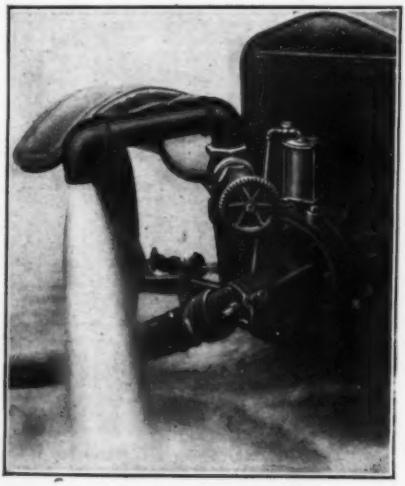
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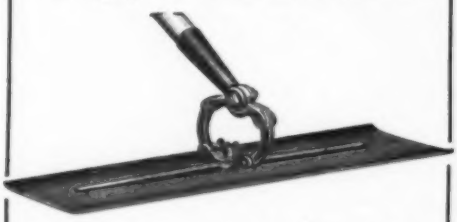
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Statement of the Ownership, Management, Circulation, etc., Required by the Act of Congress of August 24, 1912, of The Contractors' & Engineers' Monthly, Published Monthly at New York, N. Y., March 31, 1924.

State of New York, County of New York, ss.:

Before me, a Commissioner of Deeds, in and for the State and County aforesaid, personally appeared EDGAR J. BUTTENHEIM, who, having been duly sworn according to law, deposes and says that he is the Business Manager of CONTRACTORS' & ENGINEERS' MONTHLY and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in Section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business manager are:

Publisher	BUTTENHEIM-DIX PUB. CORP.,	443 4th Ave.,	N.Y.C.
Editor	THEO. R. KENDALL,	"	"
Managing Editor	THEO. R. KENDALL,	"	"
Business Manager	EDGAR J. BUTTENHEIM,	"	"

2. That the owners are: (Give names and addresses of individual owners, or, if a corporation, give its name and the names and addresses of stockholders owning or holding 1 per cent or more of the total amount of stock).

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3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages or other securities are: (If there are none, so state) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

EDGAR J. BUTTENHEIM, Business Manager

Sworn to and subscribed before me this 31st day of March, 1924. H. RADNITZ
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(My commission expires February 13, 1925).

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THE following cards (arranged by states) show the names of dealers in contractors' equipment and supplies with a record of the various lines handled. Contractors will find this list a convenient means of getting in touch with dealers who make a point of giving satisfactory service and prompt shipments. This directory is constantly consulted by our subscribers and any suggestions regarding it will be welcomed.

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"RANSOME" Concrete Mixers
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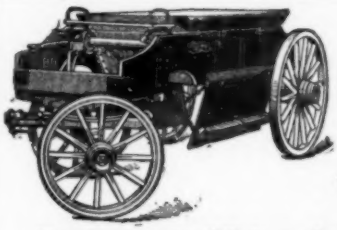
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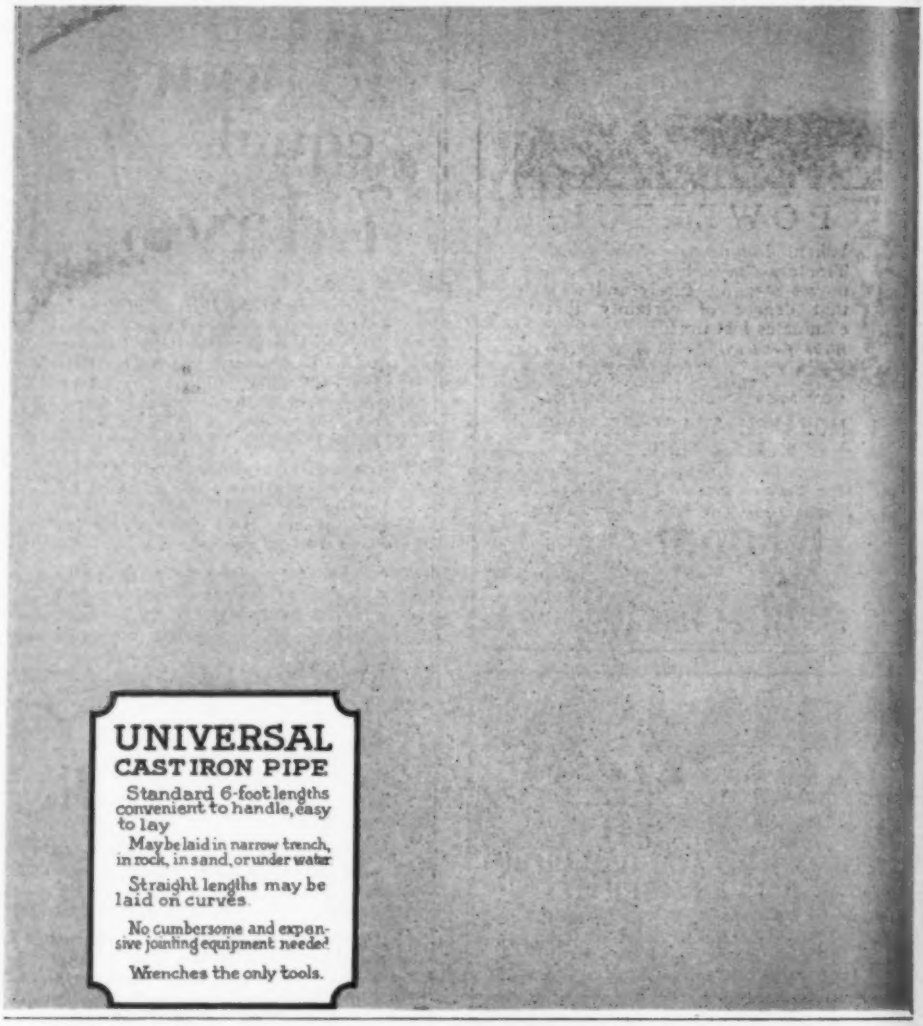
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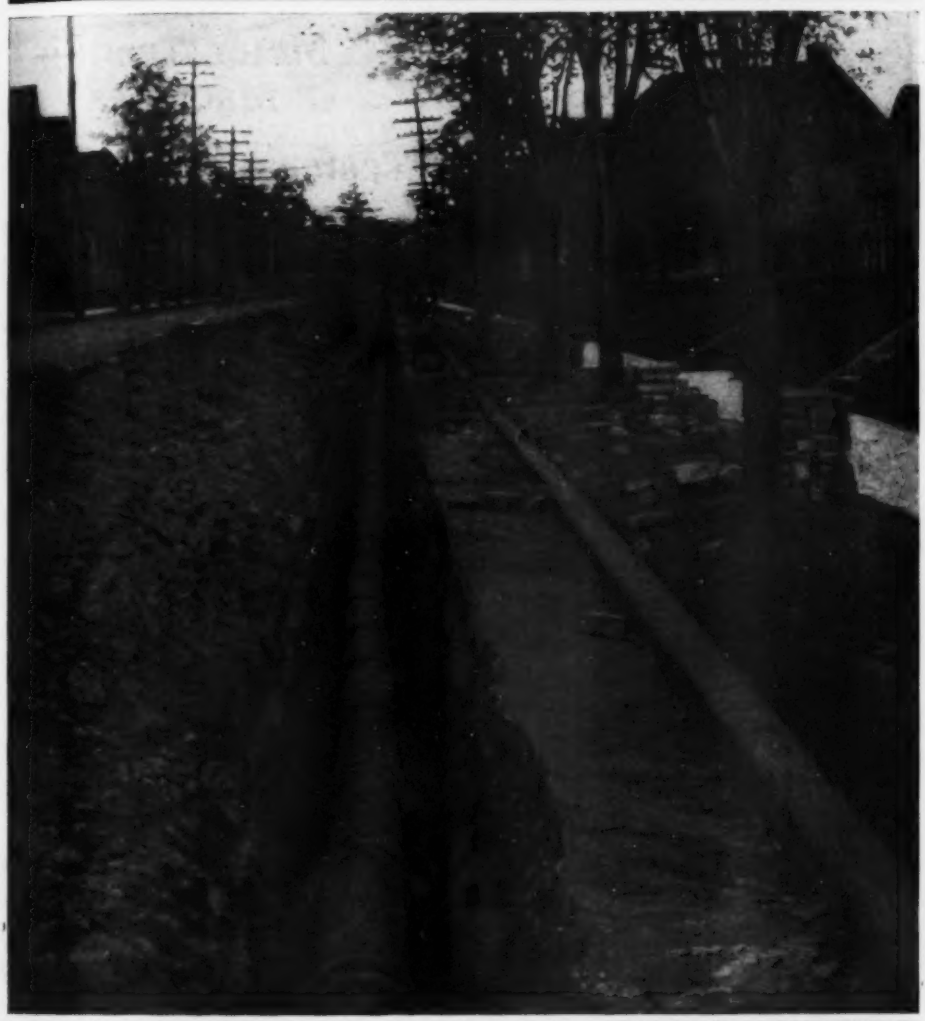
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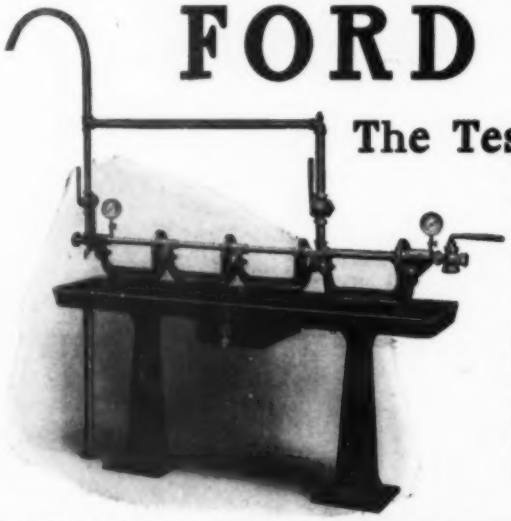
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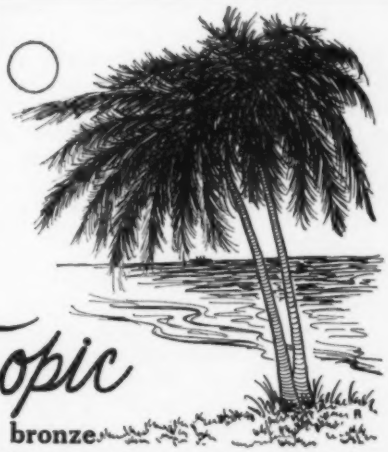
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